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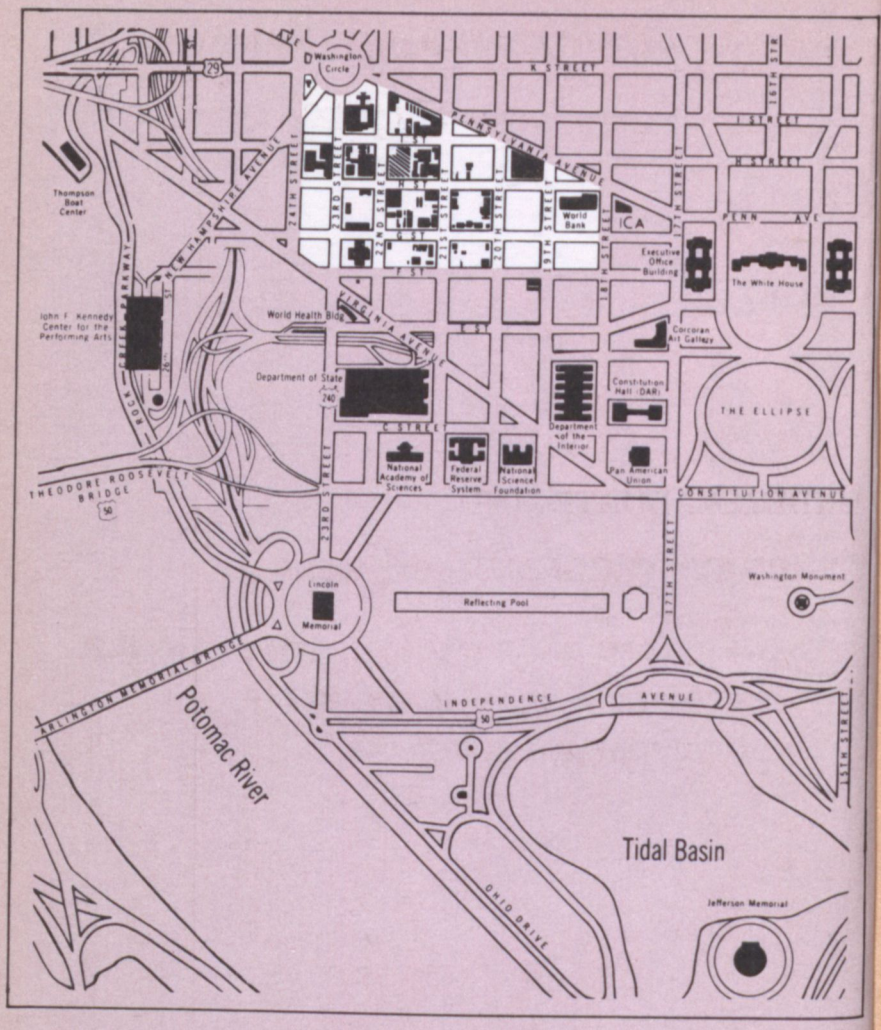
HE GEORGE WASHINGTON UNIVERSITY BULLETIN
olume LXXX, Number 3, May 1981

NDERGRADUATE AND GRADUATE PROGRAMS
81-1982



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THE GEORGE WASHINGTON UNIVERSITY BULLETIN

UNDERGRADUATE AND GRADUATE PROGRAMS 1981-1982

ARTS AND SCIENCES, EDUCATION AND HUMAN DEVELOPMENT, GOVERNMENT AND BUSINESS ADMINISTRATION, PUBLIC AND INTERNATIONAL AFFAIRS

This *Bulletin* lists the programs and faculties of Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, the School of Public and International Affairs, the Division of University and Summer Students, and the Division of Experimental Programs.

For information concerning the School of Engineering and Applied Science, the National Law Center, or the School of Medicine and Health Sciences, please request the appropriate bulletin.

UNIVERSITIES are undergoing change, either drastically or slowly, as they have been for centuries. Whatever the changes, the one premise on which universities are based remains constant: universities are for learning—for acquiring learning, for transmitting learning, and for the exploration that yields new learning. Any other objective is unworthy of a university, and any other purpose is incompatible with the best interests of students and their relationship to the institution.

The faculty, through scholarship and research, extends learning, and it transmits learning by teaching. Students learn from the faculty, the library, and the laboratory—if they accept, as they must, learning as their objective. This learning does not take place in a vacuum; in addition to the particular content of learning, students will develop certain habits of mind—analytical thinking, powers of insight, self-examination, and the use of rational discourse—that will serve them throughout their personal and professional lives.

Within this basic context, George Washington University invites students to take up their residence in order that their energies, interests, and talents may be directed to learning.

Exceptional opportunities for learning are made possible because of the University's location in the heart of the nation's capital. For example, cooperative programs are conducted in various fields of study with members of Congress, the Smithsonian Institution, the Library of Congress, the National Gallery of Art, and other federal and private organizations. In addition to these programs, Washington presents opportunities for observation, study, service, and recreation limited only by students' time, energy, and imagination.

In this atmosphere, George Washington University seeks to provide a matrix for learning not available in the standard university education, so that graduates can never forget that as students they were at the center of government and that they must forever carry additional responsibility in and for society, because of the opportunity that was theirs.

The George Washington University
LLOYD H. ELLIOTT
President

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THE CALENDAR 1981-1982*

1981 **1982**

AUGUST

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1981 **FALL SEMESTER**

August 31 Orientation begins for students from foreign countries and for freshmen who did not attend Summer Advance Registration Program

September 1 Placement tests and advising for entering freshmen who did not attend Summer Advance Registration Program

Orientation begins for transfer students

September 2 Placement tests and advising for transfer students

Advising for sophomores, juniors, and seniors in the School of Government and Business Administration

†*September 3-5* Registration; application for February graduation due as part of registration

September 7 Labor Day (holiday)

September 8 On-campus classes begin

September 9 Off-campus classes begin

University Faculty Assembly meeting

* The Academic Calendar is subject to change.

† The registration procedure and the hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

September 11	Faculty Senate meeting
September 18	Applications due for October Ed.D. Comprehensive Examinations
October 9	Faculty Senate meeting
October 14	Applications due for November Master's Comprehensive Examinations in the School of Public and International Affairs and in the School of Government and Business Administration
October 17	Ed.D. Comprehensive Examinations
October 22	Board of Trustees meeting
November 2	Applications due for spring semester financial aid
November 13	Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations Faculty Senate meeting
November 13-14	School of Public and International Affairs and School of Government and Business Administration Master's Comprehensive Examinations
November 23	D.B.A., D.P.A., Ed.D., and Ph.D. dissertations due from February candidates
November 25	Thanksgiving holiday begins after last class
November 30	Classes resume
December 8	Last day of fall semester on-campus classes
December 11	Faculty Senate meeting
December 12	Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
December 14-23	Examination period
December 21	Last day of fall semester off-campus classes
1982	**SPRING SEMESTER**
January 8	Master's theses due from February candidates
January 11	Orientation for students from foreign countries
January 12-13	Orientation for new students; advising for all students
January 13	All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for February graduation
* *January 14-16*	Registration; application for May graduation due as part of registration
January 15	Applications due for February Ed.D. Comprehensive Examinations
January 18	Spring semester on-campus and off-campus classes begin
January 21	Board of Trustees meeting
January 22	Faculty Senate meeting
January 26	University Faculty Assembly meeting
February 8	Deadline for submission of 1982-83 freshmen student financial aid applications
February 12	Faculty Senate meeting
February 15	Winter Convocation (holiday)

* **The registration procedure and the hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.**

February 27	Ed.D. Comprehensive Examinations
March 8	Deadline for submission of 1982-83 undergraduate continuing and transfer student financial aid applications
	Ph.D. and Ed.D. dissertations due from May candidates
March 10	Applications due for April Master's Comprehensive Examinations in the School of Public and International Affairs and the School of Government and Business Administration
March 12	Faculty Senate meeting
March 13	Spring recess begins after last class
March 19	Applications due for Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
March 22	Classes resume
March 25	Board of Trustees meeting
March 29	D.B.A. and D.P.A. dissertations due from May candidates
April 1	Deadline for submission of Summer Sessions and 1982-83 graduate financial aid applications
April 9	Faculty Senate meeting
April 16-17	School of Government and Business Administration and School of Public and International Affairs Master's Comprehensive Examinations
April 19	Master's theses due from all May candidates except those in the School of Public and International Affairs
April 22	All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for May graduation
April 23	Master's theses due from May candidates in the School of Public and International Affairs
	Last day of spring semester on-campus classes
April 24	Ed.D., Ed.S., and M.A. in Ed.&H.D. Comprehensive Examinations
April 29-May 8	Examination period
April 26	Last day of spring semester off-campus classes
May 1	Last day for current master's degree candidates in the Graduate School of Arts and Sciences to apply for Ph.D. programs
May 7	Faculty Senate meeting
May 9	Commencement
May 20	Board of Trustees meeting

Streets, and Washington selected Twenty-third and E Streets as the site of the National University he hoped to see established.

PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "the aspirations of Washington, Jefferson and Madison, for the erection of a university at the seat of the Federal Government." Over the years it has been the aim to develop the University ideal in the nation's capital with a view toward meeting the changing needs of society while continuing to pursue the traditional principles of learning and research.

The George Washington University now rededicates itself and all the resources at its command to the pursuit of knowledge and its dissemination.

To this end:

The University recognizes its special opportunities in and obligations to one of the principal capitals of the world. It is a primary objective of the University to utilize its historical, geographical, and functional relationship to the nation's capital and the Washington community in continuing the development of a great nationally and internationally oriented university.

The University recognizes the needs of our times and accepts the challenge to develop each student's potential abilities to the fullest extent.

The University is and should remain privately controlled, nonsectarian and coeducational.

Admission to the University is determined only in terms of the personal character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total program of the University.

Expansion of graduate and professional studies and research and the utilization for this purpose of the excellent research facilities and materials available in the nation's capital are basic to the continuous development of the University's educational program.

The provision of superior instruction and facilities and the application of high standards of entrance qualifications and academic achievement to all students whether full-time or part-time, on-campus or off-campus, are major missions of the University.

A balanced program of student extracurricular activities is an integral part of the University program.

The University will continue to strive to meet the evident needs of an enlarged student body while governing the size of enrollment by its capacity to supply adequate staff and facilities for the excellent teaching and research which it espouses.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 11 colleges, schools, and divisions, as follows:

*Columbian College of Arts and Sciences** offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts and Bachelor of Science. The College also provides prelegal and premedical programs, and the preprofessional work required for admission to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Bachelor of General Studies, Bachelor of Science in Geodesy, and Bachelor of Science in Cartographic Science. These off-campus programs are administered by the College of General Studies.

The Graduate School of Arts and Sciences†‡ offers advanced study and research leading to the degrees of Master of Arts, Masters of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science in Special Studies, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are also available through off-campus programs.

The School of Medicine and Health Sciences†† offers work leading to the degrees of Associate in Science, Bachelor of Science, and Doctor of Medicine.

The National Law Center‡ offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, electrical engineering, mechanical engineering, and operations research and computational science. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the College of General Studies.

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Human Development and Bachelor of Science in Human Kinetics and Leisure Studies; graduate studies leading to the degrees of Master of Arts in Education and Human Development, Master of Arts in Teaching, Education Specialist, and Doctor of Education. The degree of Master of Arts in Education and Human Development is also available through off-campus programs.

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* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

† The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

‡ The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

*The School of Government and Business Administration** offers an undergraduate program leading to the degree of Bachelor of Business Administration and graduate programs leading to the degrees of Master of Accounting, Master of Business Administration, Master of Health Services Administration, Master of Public Administration, Master of Science in Information Systems Technology, Master of Urban and Regional Planning, Post-Master's Graduate Certificate in Health Services Administration, Doctor of Business Administration, and Doctor of Public Administration.

*The School of Public and International Affairs** offers undergraduate programs leading to the degree of Bachelor of Arts and graduate programs leading to the degree of Master of Arts.

The College of General Studies supplements the adult education program of the University through campus and off-campus study; conferences, seminars, and special projects; and continuing education and noncredit programs. This College also administers the off-campus programs over which Columbian College of Arts and Sciences and the School of Engineering and Applied Science have academic jurisdiction.

The Division of University and Summer Students makes courses available during the regular academic year and the summer to those who are not currently degree candidates at the University.

The Division of Experimental Programs supports University-wide curricular experimentation and development, especially the development of new courses and new programs that entail interdisciplinary or interschool cooperation or that utilize educational resources in the Washington community.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The National Law Center is a charter member of the Association of American Law Schools and is approved by the Section of Legal Education and Admissions to the Bar of the American Bar Association. The School of Medicine and Health Sciences is a member of the Association of American Medical Colleges and is one of the medical colleges which have been continuously approved by the American Medical Association. Undergraduate curricula of the School of Engineering and Applied Science in civil, electrical, and mechanical engineering are accredited by the Engineers' Council for Professional Development. The School of Education and Human Development is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National Council for Accreditation of Teacher Education for its bachelor's and master's degree programs. The School of Government and Business Administration has maintained full membership in the Middle Atlantic As-

* The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

sociation of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business and, in 1977, its undergraduate program was accredited by the Assembly. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and the Certified Management Accountant professional examinations. The program in health services administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Public Administration program is on the approved list of the National Association of Schools of Public Affairs and Administration. The Master of Urban and Regional Planning degree program is recognized by the American Planners Association. The Department of Chemistry is on the approved list of the American Chemical Society. The Department of Music is an accredited member of the National Association of Schools of Music. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The program in speech-language pathology and audiology is accredited by the Education and Training Board of the American Boards of Examiners in Speech Pathology and Audiology.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the Institute for Sino-Soviet Studies, the National Law Center, and the School of Medicine and Health Sciences.

These collections contain approximately 1,126,000 volumes, to which are added some 40,000 volumes a year. Endowments supplementing the University appropriation provide books in the fields of American civilization, American literature, foreign service, history, public finance, and the social sciences; and gifts from many sources have enriched the collections. The libraries currently receive about 11,900 serials.

Information concerning the use of the libraries may be obtained at the library service desks.

The library is administered for the curricular, reference, and recreational needs and interests of the students. Instruction in the use of the library is given by the reference librarians. The library endeavors to assist students and all members of the University to use the rich library resources of Washington and the unusual opportunities they offer for extensive research. Interlibrary loan arrangements are maintained with other libraries in the city and throughout the United States.

The student has access to the Library of Congress, the Public Library of the District of Columbia and its branches, and many of the special collections of the government departments. Graduate students at George Washington University may, upon application, be issued a Consortium library card which permits direct borrowing from the libraries of the other Consortium Institutions.

THE BOARD OF TRUSTEES OF THE UNIVERSITY

The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an *ex officio* member.

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Joseph Young Ruth, B.A., *Director of Admissions*

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* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of all faculties of the colleges and schools of the University.

The Colleges, Schools, and Divisions

Calvin Darlington Linton, Ph.D., *Dean of Columbian College of Arts and Sciences*

Henry Solomon, Ph.D., *Dean of the Graduate School of Arts and Sciences*

Philip Stanley Birnbaum, B.C.E., M.S. in M.E., *Dean of the Medical Center, for Administrative Affairs*

Dennis Sophian O'Leary, M.D., *Dean of the Medical Center, for Clinical Affairs*

Lawrence Thompson Bowles, M.D., Ph.D., *Dean of the Medical Center, for Academic Affairs*

Jerome Aure Barron, LL.B., LL.M., *Dean of the National Law Center*

Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science*

Eugene W. Kelly, Jr., Ph.D., *Dean of the School of Education and Human Development*

Norma Maine Loeser, D.B.A., *Dean of the School of Government and Business Administration*

Burton Malcolm Sapin, Ph.D., *Dean of the School of Public and International Affairs*

Robert Lee Holland, Ph.D., *Dean of the College of General Studies*

William Francis Edward Long, Ph.D., *Dean of the Division of University and Summer Students*

Roderick Stuart French, Ph.D., *Director of the Division of Experimental Programs*

Fred Leonard, Ph.D., *Associate Dean of the Medical Center, for Research*

Robert Keimowitz, M.S., M.D., *Associate Dean of the Medical Center, for Student Affairs and Admissions*

Winfield Harker Scott, Ph.D., *Associate Dean of the Medical Center, for Education; Director of Education*

Robert James Van Houten, M.D., *Associate Dean of the Medical Center, for Graduate Medical Education*

Edward Andrew Potts, LL.B., *Associate Dean of the National Law Center*

Teresa Moran Schwartz, J.D., *Associate Dean of the National Law Center, for Student Relations*

James Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*

Leon Gintzig, Ph.D., *Associate Dean of the School of Government and Business Administration*

Alvin Carl Jensen, Ed.D, *Associate Dean of the College of General Studies*

Salvatore Rocco Paratore, Ph.D., *Associate Dean of the Division of University and Summer Students*

Barbara Joan Dunham, M.A., *Assistant Dean of Columbian College of Arts and Sciences*

Robert Earle Knowlton, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*

Gregory Ludlow, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*

Robert Clinton Rutledge, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*

Avery Delano Andrews, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*

Edward Alan Caress, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
Charles Edward Rice, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
David Alton Rowley, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
Robert V. Stanek, J.D., *Assistant Dean of the National Law Center; Director of Admissions (J.D. Program)*
Robert Edward Baker, Ed.D., *Assistant Dean of the School of Education and Human Development*
Paul Bernard Malone III, D.B.A., *Assistant Dean of the School of Government and Business Administration, for Undergraduate Programs*
John Lobuts, Jr., Ed.D., *Assistant Dean of the School of Government and Business Administration*
Douglas Henry Carter, M.B.A., *Assistant Dean of the College of General Studies*
Billie Jo Moreland, Ed.D., *Assistant Dean of the College of General Studies*
Abbie O. Smith, M.A. in Ed., *Assistant Dean of the College of General Studies*
LeRoy S. Paul, M.B.A., *Assistant Dean of the Division of University and Summer Students*

COMMITTEES OF THE UNIVERSITY 1980-81

Committee on the Judicial System: D. Linkowski *(Chairman)*, M.M. Cheh, T.F. Courtless, three student members

Student-Faculty Committee on Appeals: R.B. Stevenson *(Chairman)*, G. Huvé, M. McIntyre, H.E. Yeide, four student members

Committee on Religious Life: H.E. Yeide *(Chairman)*, J.G. Boswell, E.A. Caress, J.A. Greenberg, R.E. Kennedy, Jr., four student members

Committee on Student Publications: P. Robbins *(Chairman)*, A.E. Claeyssens, Jr., M.J. Jackson, D. McAleavey, W.E. Schmidt, H.E. Yeide, C. Derricotte *(ex officio)*, R. Bove *(ex officio)*, F.J. Naramore *(ex officio)*, eight student members

Committee on the University Bookstore: M.C. Devolites *(Chairman)*, I. Hsu, A.J. Mastro, M.S. Hurwitz *(ex officio)*, F.R. Munt *(ex officio)*, three student members

Committee on Federal Educational Allowances: H. Solomon *(Chairman)*, H.F. Bright, C.D. Linton, L.H. Elliott *(ex officio)*, W.D. Johnson *(ex officio)*

Committee on Research: H. Solomon *(Chairman)*, H.F. Bright, J. Eisenstein, D.R.K. Henney, C.J. Lange, F. Leonard, M.N. Rashid, L.F. Robinson, D.G. White, J.E. Ziolkowski

Committee on Sponsored Research: C. O'Rear *(Chairman)*, A.C. Hollinshead, R. Peterson, S. Rothman, S.A. Umpleby, J.E. Ziolkowski, C.J. Lange *(ex officio)*, F. Leonard *(ex officio)*, A.E. Parrish *(ex officio)*, six student members

Committee on Research on Humans: M.N. Rashid *(Chairman)*, E. Abravanel, I.H. Cisin, *M.P. Hamilton, J.W. Hillis, C.J. Lange, P. Lengermann, B.I. Levy, A.E. Parrish, J.E. Ziolkowski

Committee on Animal Facilities: E. Albert *(Chairman)*, J. Bailey, B. Bean, E. Bradley, J. Burns, G. Geelhoed, M.M. Cassidy, M. Reich, L.A. Rothblat, R. Hitzelberg *(ex officio)*, C.J. Lange *(ex officio)*, F. Leonard *(ex officio)*, B. Zook *(ex officio)*

Committee on University Parking: M.M. Barch *(Chairman)*, J.E. Clifford, R.R. Fox, J.B. Levy, M.R. Phelps, C.E. Diehl *(ex officio)*, J.C. Einbinder *(ex officio)*, J. Mello *(ex officio)*, F.R. Munt *(ex officio)*, four student members

THE FACULTY SENATE 1981-82

†Jerome Aure Barron
†Philip Stanley Birnbaum
†Harold Frederick Bright
Martha Burns
James Philip Chandler
Astere Evarist Claeyssens, Jr.
Salvatore Frank Divita
Rodney Eldridge
Mervyn Elgart
†Lloyd Hartman Elliott
Raymond Richard Fox
John Andrew Frey
†Robert Gebhardtsbauer
William Byron Griffith
Donald Hawkins
‡Peter Proal Hill
†Eugene W. Kelly, Jr.
†Harold Liebowitz
†Calvin Darlington Linton
†Norma Maine Loeser
Guido Ettore Mazzeo
John Andrew Morgan, Jr.
Randall Kent Packer
Howard Clemeth Pierpont
Lilien Filipovitch Robinson
James Minor Sachlis
†Burton Malcolm Sapin
Stefan Otto Schiff
Benjamin Williams Smith
George Wilson Smith
†Henry Solomon
Lewis David Solomon
Henry Malcolm Steiner
Theodore George Toridis
Ruth Ann Wallace
Elyce Zenoff
John Edmund Ziolkowski

Mary M. Cheh, *Parliamentarian*

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* Canon of Washington Cathedral
† Ex officio member
‡ Chairman of the Executive Committee

ADMISSION

The University accepts both men and women. Students are admitted at the beginning of each semester and summer session.

An application for admission to degree candidacy should be accompanied by a $15 (for undergraduate study) or $25 (for graduate study) application fee.* The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants are urged to submit the application form and complete credentials well in advance of the semester for which they seek admission. Specific dates are given in each section below.

Acceptance is based on space available and a prediction of potential for successful study. The following criteria are considered: degree or major objective related to rigor of program and grades achieved in secondary school or college, standardized test scores, relationship between grades and test scores, and recommendations.

The right is reserved to refuse admission to any student with an academic record which creates doubt of ability to succeed in college or who, for any other reason, would not be an acceptable student. In the selection process, there is no discrimination because of sex, race, religion, handicap, national origin, or age.

UNDERGRADUATE ADMISSION†

Forms for application for admission or readmission to undergraduate or nondegree status are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Secondary School Students

Applicants who wish to begin college in the fall semester or in a summer session should apply during the fall term of the senior year in high school. Preference will be given to students who submit applications and required credentials prior to March 1. Students graduating at mid-year who wish to begin college in the spring semester should apply no later than November 1.

Early Notification—Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after September 1 to students whose applications become complete with secondary school records

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* Application fee must be by check or postal money order, payable to George Washington University.

† For detailed admission requirements, see the appropriate college or school in this *Bulletin*. Tests required for admission are described on pages 75 and 139. See pages 26-27 for admission requirements for students from foreign institutions.

through the junior year and junior-year test scores, provided these records clearly establish admissibility.

Early Admission Plan—Unusually well-prepared students who have completed the junior year in high school may be considered for admission. This plan is designed for those students who, in terms of academic preparation and emotional maturity, are ready to enter college. More often than not, students interested in early admission have substantially exhausted the high school offerings in several academic areas. For such students, remaining in high school for the senior year would not be in their best interest, nor in the best interest of the school.

To be considered for early admission, students must:

1. meet most of the secondary school requirements for graduation and complete the University's required entrance units (see page 68),
2. have the unqualified recommendation of the secondary school principal or counselor,
3. submit two letters of recommendation (in addition to the counselor's) from teachers who can testify to the student's maturity and general readiness to enter college,
4. submit SAT or ACT scores.

The student's chances for admission will be improved if scores of CEEB achievement tests or Advanced Placement Tests in subjects taken in the sophomore year are submitted.

Applicants from a secondary school must arrange to have sent directly from their schools to the Office of Admissions a complete academic record together with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the secondary school.

Transfer Students

Undergraduate transfer students from other institutions should submit application and required credentials prior to June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions.

The transfer student must be in good standing as to scholarship and conduct. A student who has been academically dismissed or suspended more than one time normally will not be considered for admission.

An applicant who has attended one or more institutions of higher learning must request each registrar to mail directly to the Office of Admissions a transcript of his or her record, *even though credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (C or better in academic courses from an accredited institution) at the time the application is submitted, the applicant must request that his or her high school record and College Entrance Examination Board or ACT test scores be sent to the Office of Admissions.

Advanced Tuition Deposit

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students including those readmitted. This deposit is not due until May 1 for students entering in the fall se-

mester or until December 15 for students entering in the spring semester. The deposit is credited toward tuition and is not refundable.

Advanced Standing and Advanced Placement

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work or examination, credit may be granted for work successfully completed at accredited institutions of higher learning. Although transfer credit may be assigned, it must meet requirements for the degree sought in order to be counted towards that degree. Credit may be accepted provisionally. Work of low-pass grade (*D* or the equivalent) will not be considered for transfer.

Except for students transferring to the School of Government and Business Administration or to Columbian College of Arts and Sciences from two-year colleges, in which case no more than 60 or 66 semester hours of credit may be assigned, respectively, there is no strict limit to the total amount of credit that may be assigned. However, a student must satisfy the residence and course requirements for the degree sought at George Washington University.

CREDIT BY EXAMINATION

Assuming there is no duplication of course work, a maximum of 30 semester hours of credit may be assigned upon admission to the University for each or any combination of the following except as noted:

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT TESTS (APT)

Credit is assigned for examinations passed with scores of four or five on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. The Advanced Placement Tests are administered in the secondary school in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 1025, Berkeley, Calif. 94701.

COLLEGE ENTRANCE EXAMINATION BOARD COLLEGE-LEVEL EXAMINATION PROGRAM (CLEP)

CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in more than 20 subjects.

Upon admission to a program leading toward a degree, credit is

assigned for the General Examinations, with the exception of the English composition examination and the mathematics examination.* To receive credit, examinations must be passed at the 50th percentile or above (1963/1972 college sophomore norms). Credit is assigned, with a few exceptions, for the Subject Examinations passed at the level recommended in the College Board model policy.* A candidate for a degree who is registered at this University must seek departmental and dean's approval *prior* to taking the examination to receive credit for a CLEP Subject Examination. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 1824, Princeton, N.J. 08540.

SPECIAL DEPARTMENTAL EXAMINATIONS FOR UNDERGRADUATES

Except for students admitted to the School of Government and Business Administration, credit may be assigned for Special Departmental Examinations, see page 77.

CREDIT EARNED THROUGH UNITED STATES ARMED FORCES INSTITUTE (USAFI)

Except for students enrolled in the School of Government and Business Administration, credit is assigned for approved United States Armed Forces Institute college-level examinations passed with satisfactory scores.

CREDIT FROM SERVICE SCHOOLS

Except for undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected service school instruction received since 1941. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

CREDIT FOR COURSES OFFERED BY NONCOLLEGIATE ORGANIZATIONS

Except for undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected courses offered by noncollegiate organizations. The University assigns some of the credit listed in the *National Guide to Credit Recommended for Noncollegiate Courses.* Students who wish to know if courses offered by their employers can be considered for credit should inquire at the Office of Admissions. Courses containing fewer than 30

* See page 143 for additional qualifications for applicants to the School of Government and Business Administration.

hours of class instruction are not reviewed. Records, which vary with the sponsoring organization, will be required.

CREDIT FOR COURSES OFFERED THROUGH CORRESPONDENCE AND TELEVISION

Except for undergraduates admitted to the School of Government and Business Administration, a limited amount of credit may be assigned for selected courses offered by non-traditional methods, provided that such courses require the student's physical presence in a monitored final examination. Assignment of such credit will require a statement from the institution concerned that such an examination was a required part of the course.

ADVANCED PLACEMENT

Advanced placement or waiver of a requirement will be granted on the basis of scores on Achievement Tests of the College Entrance Examination Board as follows:

Achievement Test	Minimum Score	Exemption
English Composition	650	Waives Engl 10
European and/or American History	600	Waives Hist 39-40 and/or 71-72
French	650	Waives a two-year language requirement
German	600	
Hebrew	600	
Latin	600	
Russian	700	
Spanish	650	

A score of 58 or above on the Test of Standard Written English will waive English 10.

GRADUATE ADMISSION*

Graduate School of Arts and Sciences—Forms for application for admission or readmission are available at the Office of the Dean of the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052. Completed applications and requests for fellowship support must be submitted by February 15 (February 1 for students in clinical psychology and art therapy) for admission in the fall semester and by November 1 for the spring semester. Applications for graduate study are acceptable after these dates for admission in the corresponding semester and will be reviewed if time permits and if space is available in the program desired.

School of Education and Human Development—Forms for application for admission or readmission are available at the Office of the Dean of the School of Education and Human Development, George Washington University, Washington, D.C. 20052. When completed, these application forms should be submitted to this Office no later than June 1 for the fall semester.

* For detailed admission requirements, see the appropriate college or school in this *Bulletin*. See pages 26-27 for admission requirements for students from foreign institutions.

November 1 for the spring semester and April 1 for the summer sessions, unless an extension is granted by the office of the dean.

School of Government and Business Administration—Forms for application for admission or readmission are available at the Graduate Admission Office, School of Government and Business Administration, George Washington University, Washington, D.C. 20052. The Application for Graduate Degree Candidacy shows the application deadlines for the degrees offered by this school.

School of Public and International Affairs—Forms for application for admission or readmission are available at the Graduate Admissions Office, School of Public and International Affairs, George Washington University, Washington, D.C. 20052. When completed, these application forms should be submitted to this Office no later than March 1 (February 1 for applicants for graduate fellowships or assistantships and foreign applicants). Admission is for the fall semester only. All credentials, including transcripts from all institutions attended, Graduate Record Examination scores and letters of reference, must be received before the deadline date.

DIVISION OF UNIVERSITY AND SUMMER STUDENTS ADMISSION

Forms for application for admission to *nondegree* status in the Division of University and Summer Students are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052. When completed, these application forms, with credentials when required, should be received by the Office of Admissions no later than the Friday before the first day of registration (see Calendar, pages 5-7). To avoid paying a late registration fee, every effort should be made to insure that any required credential is in the Office of Admissions prior to registration. No fee is charged for application for admission to this Division. For detailed entrance requirements, see page 183.

Registration in a given course may be denied students in this Division when space is needed for degree candidates. Unless working toward a degree elsewhere, students in this Division may not take accounting, business administration, or management science courses.

READMISSION

Students previously registered in the University who were not registered in campus during the immediately preceding semester (summer session excluded), must apply for readmission. Final dates for applying are the same as those for "Undergraduate Admission" (see pages 20-21), or "Graduate Admission" (see pages 24-25). Students who apply as degree candidates and who were previously registered as nondegree students, or who attended one or more institutions of higher learning during absence from the University, must have complete official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations in effect at the time of readmission.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time of last registration at this University and who have not since registered at another institution.

STUDENTS FROM FOREIGN INSTITUTIONS*

Application, required records, and scores on the *Test of English as a Foreign Language* (see below) should be received from international students no later than March 1 (February 1 for applicants for graduate study in the School of Public and International Affairs) for the fall semester and October 1 for the spring semester.

George Washington University offers an English-language program for foreign students.

Required Records

At the time the application is sent, students must request the educational institution previously attended to send directly to the appropriate admissions office (see "Undergraduate Admission," pages 20-21, or "Graduate Admission," pages 24-25) copies of official certificates and records listing subjects studied, grades received, examinations taken and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation.

Language Tests

Students whose native tongue is not English should take the *Test of English as a Foreign Language* (TOEFL) and have the scores submitted to the appropriate admissions office. Those students seeking admission to the School of Government and Business Administration must submit a TOEFL score. Students are responsible for making arrangements for taking the test by addressing inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08540, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does not constitute application for admission to George Washington University.

The *Bulletin of Information*, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports and the conduct of the test; lists of examination centers; examination dates and an application blank. On the application for the test, the student should specify that the scores be sent to the appropriate admissions office at this University (see "Undergraduate Admission," pages 20-21, or "Graduate Admission," pages 24-25).

An admitted student scoring less than 600 on the TOEFL is required to take a test in English as a second language prior to registration. Results of this test will determine the courses in which the student will be permitted

* For detailed admission requirements, see the appropriate college or school in this *Bulletin*.

to register. If the knowledge of English is inadequate to enable the student to undertake any academic work, the student will be required to study English on a full-time basis.

Financial Certificate

If a student plans to enter or remain in the United States to study at this University and the visa status will be either student (F) or exchange visitor (J), a Form I-20 or IAP-66 cannot be issued until the student has been admitted to the University and has completed the Financial Certificate to our satisfaction.

TRANSFER WITHIN THE UNIVERSITY

For information concerning transfer from one college, school, or division to another within the University, see page 47.

REGISTRATION

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study.

No registration is accepted for less than a semester or one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

Eligibility for Registration

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register. Registration in a given course may be denied students in the Division of University and Summer Students when space is needed for degree candidates.

New Student—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered in the University who was not registered on campus during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before he or she is eligible for registration.

Continuing Student—The student registered on campus in the immediately preceding semester or the summer session preceding the fall semester is eligible to register assuming good standing and enrollment in a continuing program.

Completion of Registration

Registration is not complete until financial settlement is made. Attendance in class is not permitted until registration has been completed.

Registration Changes and Withdrawals (See page 47)

Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc. (see page 53), should consult the program announcements of the other institutions. Consortium registration forms and instructions may be picked up in the Office of the Registrar after obtaining registration materials. In order to participate in the Consortium program, students must obtain the approval of an advisor and should ascertain from the department of the institution where the course is taught whether they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the Registrar.

FEES AND FINANCIAL REGULATIONS

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 198 summer sessions and the academic year 1981-82.

Tuition Fees

For undergraduate study in Columbian College of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, the School of Public and International Affairs; and for courses taken on campus by undergraduate students in the College of General Studies

Full-time program (12 or more semester hours), each semester	$2,050.0
Part-time program, for each semester hour	150.0
Summer Sessions, for each semester hour	134.0

For graduate study* in the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration† and the School of Public and International Affairs; for graduate and undergraduate courses taken through the Division of University and Summer Students; and for courses taken on campus by graduate students in the College of General Studies:

Each semester hour for which a student registers	$150.00
Summer Sessions, each semester hour	134.00

University Center Fee (charged all students registered on campus)

For students registered for 11 or more semester hours:	
Each semester	55.50
For students registered for less than 11 semester hours:	
Each semester hour	5.25

Future Tuition Increases—The University has had a policy of projecting tuition increases for four years in advance; however, the uncertainty of current economic conditions will not permit continuance of this policy. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound educational basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition may be required.

Additional Course Fees

In certain courses additional fees, such as laboratory and material fees, are charged as indicated in the course descriptions. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Graduation Fees

Associate in Arts	$10.00
All other degrees offered by the University	25.00
Fee for binding master's thesis	15.00
Fee for microfilm service and printing announcement of final examination (doctoral candidates)	65.00

Residence Hall Fees (see pages 59-60)

Special Fees and Deposits

Application fee (undergraduate degree candidate), nonrefundable	15.00
Application fee (graduate degree candidate), nonrefundable	25.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	100.00
Admission tests (when required)	6.00–12.00

* Payment of tuition for a master's thesis entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional semester hours may be required in accordance with the regulations of the school in which the student is registered.

† Students entering doctoral programs in the School of Government and Business Administration in 1981-82 will be charged $11,350 for the entire degree program, to be paid in 10 semiannual installments. Contact the School's Doctoral Programs Office.

Late-registration fee, for failure to register within the designated period	15.0
Late-payment fee (see Payment of Fees, below)	15.0
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, below)	35.0
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.0
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.0
For each waiver examination to qualify for advanced placement	5.0
English test for international students (when required)	10.0
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*	10.0
Transcript fee, for each transcript of record	2.0
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.5
Replacement of lost or stolen picture identification card	2.0

Registration for on-campus courses in the University entitles each studen to the following University privileges: (1) the services of the Studen and Alumni Career Services Office; (2) the use of the University Library (3) gymnasium privileges; (4) admission to all athletic contests, unles otherwise specified; (5) subscription to the *University Hatchet*, the studen newspaper; (6) admission to University debates; (7) medical attention a described under Student Health Service. These privileges terminate whe the student withdraws or is dismissed from the University.

Postdoctoral Study

George Washington University doctoral graduates may continue any studie in the University without payment of tuition, and enjoy all Universit library privileges. Such graduates are required to pay a nominal fe based on the prevailing credit hour rate for one semester hour, a well as the University Center fee, in order to establish their active mem bership in the University. The use of laboratory space and equipmen is contingent upon availability, and the cost of all laboratory or specia library material is paid by the graduate. Special arrangements for suc privileges must be made with the dean two months in advance o the semester in which the graduate wishes to register. Postdoctoral wor taken under this privilege may not be applied toward any degree offere by the University.

Payment of Fees

No student is permitted to complete registration or attend classes until a charges are paid. Tuition and fees for each semester are due and payable i full at the Office of the Cashier at the time of each registration. Check should be made payable to George Washington University, with th student identification number in the upper left-hand corner.

*A student who drops a chemistry course before the end of the semester must check out of t laboratory at the next laboratory period.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $800.00 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

Returned check—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student will forfeit all rights to check cashing at the University, and future payments for tuition, dormitory, food service, and other special fees will require payment by cash, certified check, or money order.

Prepaid and Deferred Payment Plans

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean of the college school, or division in which the student is registered. Notification to an instructor is not an acceptable notice (see "Withdrawal," page 47).

In authorized withdrawals and changes in schedule, cancellations or semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal from the University:*

Withdrawal dated on or before Saturday of the first week of classes..	90%
Withdrawal dated on or before Saturday of the third week of classes.	75%
Withdrawal dated on or before Saturday of the fifth week of classes..	50%
Withdrawal dated after the fifth week of classes	None

2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.

3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.

4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

* **Regulations** concerning withdrawal and refunds for the summer sessions are stated in the ***Summer Sessions Schedule***.

FINANCIAL AID

FOR UNDERGRADUATE STUDENTS*

George Washington University offers a program of financial assistance of two basic types: awards for academic achievement without reference to financial circumstances—honor scholarships; and scholarships, grants, loans, and employment based upon demonstrated financial need.

Honor Scholarships—George Washington University honor scholarships of up to half-tuition for the academic year, based entirely upon academic achievement and potential without regard to financial need, are restricted to incoming freshmen and are extremely limited in number.

Need-based Aid—The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the National Direct Student Loan, Basic Educational Opportunity Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed by February 1 (entering freshmen) or March 1 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.† A student must reapply for financial aid each year.

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available at the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

The following scholarships are available to students in Columbian College of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs.

The George Washington University Board of Trustees Scholarships—Full- and partial-tuition scholarships, which begin in the fall semester and extend for four successive academic years, provided the holder maintains a B average and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree in any school listed above. Students who have demonstrated outstanding ability in interscholastic speech and debate activities are eligible for the George F. Henigan Scholarships in Debate which are included among these scholarships.

Other Scholarships

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship

*For information concerning financial aid for students from foreign countries, see page 39.
†Only students who are enrolled in this University for at least six semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for Summer Sessions financial aid.

Sherman Page Allen Memorial Scholarship Fund (1966)
Alumni Scholarships
Mary J. Anderson Scholarship (1969)
Athletic Scholarship Fund (1979)
Bache and Company Scholarships
Byron Andrews Scholarship (1920)
Henry N. Brawner, Jr., Foundation Scholarship Fund (1963)
Emma K. Carr Scholarships (1932)
Maria M. Carter Scholarship (1871)
Paul E. Casassa Memorial Foundation Scholarship (1968)
The Chesapeake and Potomac Telephone Company Scholarship (1978)
Columbian Women Scholarship Funds
Victoria Briggs Scholarship Fund (1959)
Elizabeth V. Brown Scholarship Fund (1925)
Grace Ross Chamberlin Scholarship Fund (1932)
College Women's Scholarship Fund (1926)
Columbian Women Members' Scholarship Fund (1961)
Arline Hughes Dufour Scholarship Fund (1961)
Dr. Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fu
(1964)
Founders of Columbian Women Scholarship Fund (1920)
Rose Lees Hardy Foundation Scholarship Fund (1957)
Lillian Young Herron Scholarship Fund (1925)
Nellie Maynard Knapp Scholarship Fund (1915)
Marcia B. Kraft Scholarship Fund (1966)
Janet McWilliams Scholarship Fund (1954)
Marie-Louise Ralph Turner Scholarship Fund (1963)
D.C. Daughters of the American Revolution Scholarship (1952)
Isaac Davis Scholarship (1869)
District of Columbia Institute of Certified Public Accountants Scholarsh
in Accounting (1964)
Estella Constance Drane Scholarship (1957)
Robert Farnham Scholarship (1871)
Federal Government Accountants Association—Washington, D.C., Chapt
—Scholarship in Accounting
Esther Brigham Fisher Scholarship (1951)
George Washington University Tennis Alumni Association Scholarsh
(1974)
Mildred Green Memorial Scholarship Fund (1959)
Gridiron Foundation of the Gridiron Club Scholarship (1975)
Isadore and Bertha Gudelsky Family Scholarship (1978)
Anna Spicker Hampel Scholarship (1949)
Julian O. Hargrove Scholarship (1968)
Elma Lewis Harvey Scholarship (1921)
Hazleton Scholarship (1950)
George F. Henigan Scholarships in Debate (1967)
International Student Scholarships (see page 39)
David B. and James L. Karrick, Jr., Scholarship Fund (1968)
Samuel and Elizabeth Kay Scholarships (1969)
Amos Kendall Scholarship (1869)
L. Poe Leggette Memorial Scholarship Established by WRGW (1968)

Mary and Daniel Loughran Scholarship (1976)
Martha's Marathon Residence Hall Scholarship (1969)
Maud E. McPherson Scholarship in English and English Literature (1978)
A. Morehouse Scholarship (1861)
E. K. Morris Education Fund Scholarships (1972)
Helen Marie and Thomas E. Orr Scholarships (1965)
Hardy Pearce Scholarship Fund (1972)
Phi Delta Gamma Scholarships (1956)
Fred B. and Alma D. Pletcher Scholarship Fund (1968)
Levin M. Powell Scholarships (1886)
Research Assistantships in Operations Research and Related Fields (see page 36)
Resident Assistantships (see page 36)
Henry Whitefield Samson Scholarship Fund (1966)
Lula M. Shepard Scholarships (1946)
Sigma Delta Chi Foundation of Washington, D.C., Scholarships
Margaret Lucille Snoddy Scholarship (1970)
David Spencer Scholarship (1918)
Mary Lowell Stone Scholarship (1893)
Charles Clinton Swisher Scholarships (1941)
U.S. Office of Education Traineeships (1964)
University Players Scholarship in Memory of L. Poe Leggette (1968)
William Walker Scholarship (1824)
Abigail Ann Brown and Henry Kirk White Scholarship Fund (1963)
John Withington Scholarship (1830)
Women's Physical Education Alumnae Association Scholarship (1964)
William G. Woodford Scholarship (1969)
Ellen Woodhull Scholarship (1919)
Zonta Club Scholarship (1950)

Grants

The following funds have been established to meet the special needs of disadvantaged students from the District of Columbia Inner-City and the Washington metropolitan area.

George Washington University's Educational Opportunity Program Tuition Grants (1968)
Key Club of Walt Whitman High School, Bethesda, Md., Grant (1968)
Marriott Foundation Grant (1968)

FOR GRADUATE STUDENTS*

The George Washington University program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. Application for admission to graduate study is a prerequisite for consideration.

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the dean

*For information concerning financial aid for students from foreign countries, see page 39.

of the school concerned, and addressed to George Washington Universit Washington, D.C. 20052. Unless otherwise specified, application and su porting credentials should be submitted no later than February 1 pr ceding the academic year for which the award is made.

Assistantships

Research Assistantships in Operations Research and Related Fields Available to graduates, and to undergraduates on the junior and seni levels, in any school of the University. Research assistants are expect to work 20 hours a week conducting research in support of an establish research program, in programming or in conducting individual research an approved research project. Stipends range up to $8,000, depending the status of the student and the tenure of the appointment (9–12 month Further information and applications are available from Director, Institu for Management Science and Engineering, School of Engineering and A plied Science, George Washington University, Washington, D.C. 20052.

Resident Assistantships (men and women)—Available to graduate s dents and seniors in any field of study who are interested in working wi the student personnel program in University residence halls. Specific dut vary with the position, but basically consist of counseling, advising stude groups, and administration. Remuneration includes partial tuition and furnished room for the academic year. All positions are part-time, a staff members are required to enroll as full-time students in degree gra ing programs. Further information may be obtained from the Office the Director of Housing.

Health Services Administration Research Assistantships
National League of Cities/George Washington University Assistantship
Urban Affairs Assistantship

Fellowships, Internships, Traineeships, Special Programs

The following fellowships, internships, and traineeships are available students in the Graduate School of Arts and Sciences, the School of Edu tion and Human Development, the School of Government and Business A ministration, and the School of Public and International Affairs. The U versity also offers many other fellowships which are available to stude in these colleges and schools.

University Fellowships—Available to graduate students in master's a doctoral programs in most departments of the University. Fellowships based on scholarship and each fellow may receive a stipend, tuition allo ance, and course fees.

Graduate Teaching Assistantships—Available to graduate students master's and doctoral programs in most departments of the University. graduate teaching assistant receives financial compensation for a des nated unit of service to the assistant's major department of instruction

Research Traineeships—Available under numerous sponsored progra in a number of departments. Currently, the basic medical science dep ments and the Departments of Psychology and Speech and Drama o such programs. Stipends vary; information is available from the dep

nents and the Office of the Dean of the Graduate School of Arts and Sciences.

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Fellowship
Robert A. Aleshire Fellowship Fund (1971)
American Association of Collegiate Schools of Business Fellowship
American Civilization Fellowships
American Civilization Internships (Smithsonian Institution-George Washington University Cooperative Program)
American Iron and Steel Institute Fellowship
Arthur Anderson & Co. Doctoral Fellowship
Aryamehr Research Fellowships
Winfield Scott Blaney Fellowship in International Affairs (1961)
Oliver T. Carr, Sr., Memorial Fellowship in Urban and Regional Planning (1973)
Thomas Alva Edison Fellowship
Elementary Teacher Education Internships
Ernst & Ernst Grant to Doctoral Candidates in Business or Economics
Health Care Administration Fellowships
International Student Fellowships (see page 39)
Richard D. Irwin Doctoral Fellowships
Isabella Osborn King Research Fellowships (1927)
Paula D. Lasker Fellowships in Housing, City Planning, or Urban Renewal
Mary and Daniel Loughran Graduate Scholarship (1976)
George McCandlish Fellowship in American Literature (1980)
Mellon Foundation Fellowships
Minorities in Planning and Related Professions Program
National Association of Purchasing Management Fellowship
National Historical Publications Commission-George Washington University Cooperative Research Fellowships
National Science Foundation Graduate Fellowships
Resources for the Future, Inc., Fellowship Prize
Rose Bibliography Internships
Thomas Bradford Sanders Fellowships (1928)
Scottish Rite Foundation Fellowships
U.S. Office of Education Fellowships (1964)
U.S. Public Health Service Traineeships
U.S. Public Health Service Traineeships in Comprehensive Health Planning
Urban Studies Fellowships of the Department of Housing and Urban Development
Urban Transportation Center Fellowship
Donald Barbour Weintraub Research Fellowship in Biological Sciences (1980)

Graduate Scholarships

Armed Forces Health Professions Scholarship Program (The Uniformed Services Health Professions Revitalization Act of 1972—Public Law 92-426)
Barbee Sculptor Scholarship (1975)
Emma K. Carr Scholarships (1932)

District of Columbia Institute of Certified Public Accountants Scholarsh
in Accounting (1964)
Genetics Graduate Scholarship (1979)
Myron L. Loe Scholarship Fund (1975)
Mary and Daniel Loughran Graduate Scholarship (1976)
Foster G. McGaw Scholarship in Health Care Administration (1971)
Paul Pearson Scholarship Fund (1940)
Phi Delta Gamma Scholarship Fund (1968)
Voorhees Scholarships
Wolcott Foundation Scholarships

Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional a
learned societies, industries, and others which may be used in support
graduate study is available at the Graduate Fellowship Information Ce
ter, 2025 H St., N.W., for students enrolled at George Washingt
University. Information is also available on distinguished programs such
the Rhodes, Marshall, National Science Foundation, Fulbright, and Rota
International, as well as many others.

As deadlines for application vary, qualified students should make
quiries well in advance of the year of planned graduate study.

LOAN FUNDS

The following loan funds are available to undergraduate and/or gradua
students in Columbian College of Arts and Sciences, the Graduate Scho
of Arts and Sciences, the School of Education and Human Developme
the School of Government and Business Administration, and the Scho
of Public and International Affairs. A separate application must be su
mitted for all loan programs. Applications for the National Direct Stude
Loan should be filed no later than April 1 for the following academic ye
Complete information is contained in the pamphlet "Student Financ
Aid," which is available in the Office of Student Financial Aid, Geo
Washington University, Washington, D.C. 20052.

American Medical Association Nursing Home Administration Loan Fund
George F. Henigan Loan Fund (1975)
International Student Loan Fund (1967)
Joanne Jacobs Student Loan Fund (1974)
W. K. Kellogg Foundation Hospital Administration Loan Fund
Jessie B. Martin Loan Fund (1967)
National Direct Student Loan Program
Ellis H. Stearman Emergency Loan Fund
Hiram Miller Stout Memorial Loan Fund (1973)
University Student Emergency Loan Fund

STUDENT EMPLOYMENT

The University participates in the College Work-Study Program. Inquir
should be addressed to the Office of Student Financial Aid. In addition,

Student and Alumni Career Services Office maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration, students may apply at the Student and Alumni Career Services Office, Woodhull House, 2033 G Street, N.W., for interviews and referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, page 33.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

We suggest that students who wish to study in the United States have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is approximately $8,000. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

PRIZES

Accounting Prizes—Three prizes for academic excellence awarded annually by the Department of Accounting—two at the undergraduate level and one at the Master of Accounting level.

Morris M. Aein Memorial Prize—Awarded to a deserving student for excellence in drawing.

Alpha Chi Sigma Prize—Awarded annually by the Alpha Pi Chapter to the student who has attained the highest academic record in courses in chemistry. The name and year of graduation of the student is inscribed on a bronze plaque. The winner must have had at least 16 hours in chemistry, including the final semester at this University.

American Chemical Society Prize—Awarded to an undergraduate stu dent who has completed the junior year and who has demonstrated ex cellence in analytic chemistry.

American Institute of Chemists Prize—A medal awarded annually to th graduating student majoring in chemistry who excels in scholarship, in tegrity, and leadership.

Department of Art Prizes—Two prizes—one for a senior in art histor and one for a senior in the fine arts—awarded annually to the most promi ing students, as determined by the departmental faculty.

The Walter G. Bryte, Jr., Achievement Award—Provided by Walter G Bryte, Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science George Washington University. The award is presented annually primaril to that undergraduate residence hall, secondarily to any other activity the University, which has shown under the leadership of its elected designated head, the most improvement or excellence in its support of th principles and aims of the United States of America and George Was ington University. The hall or other activity will be awarded a cash priz and the name of its leader and the hall or activity will be engraved on silver trophy.

Byrne Thurtell Burns Memorial Prize—Awarded to the senior majoring i chemistry who shows the greatest proficiency in organic chemistry, as ev denced by a comprehensive examination, and who possesses such qualific tions of mind, character, and personality as to give promise of futur achievement.

Business Administration Prize—Awarded annually by the Department Business Administration to the outstanding graduating senior in busine administration on the basis of scholarship, leadership and service to th University.

Wilbur J. Carr Prize—Established in 1962 by Edith K. Carr, former Tru tee of the University, in memory of her distinguished husband, who w graduated from the School of Comparative Jurisprudence and Diploma in 1899. It is awarded annually to that student in the graduating class the University who has demonstrated outstanding ability in the study international affairs and who has given evidence of possessing in mark degree the qualities which produce the good citizen and the dedicat public servant.

Chemical Rubber Company Freshman Chemistry Achievement Prize A Handbook of Chemistry and Physics awarded annually to the freshm student who has demonstrated the greatest achievement in Chemistry 15-

Chemical Society of Washington Prize—Awarded to an outstandi undergraduate in the junior year who is majoring in Chemistry.

John Henry Cowles Prizes—Two prizes, established by John H. Cowl Grand Commander of the Supreme Council of Thirty-third Degree (Moth Council of the World) of the Ancient and Accepted Scottish Rite of Fr masonry, Southern Jurisdiction of the United States of America. Award annually to the senior in the School of Government and Business A ministration and to the senior in the School of Public and Internatio Affairs with the highest academic averages.

DeWitt Clinton Croissant Prize—Awarded annually to the undergradu student enrolled in a course in drama or active in University dramatics w

ubmits to the English Department the best essay on drama or the theater.

E.K. Cutter Prize—Established by Marion Kendall Cutter "for excellence n the study of English." Awarded to the member of the graduating class whose record in English, combined with general excellence, shows most narked aptitude for and attainment in English studies.

Isaac Davis Prizes—Established in 1847 and awarded annually to the hree seniors who have made the greatest progress in public speaking while enrolled in the University. Awards are to be determined by a public-peaking contest in which the participants deliver original orations. Only nembers of the senior class of Columbian College of Arts and Sciences who are candidates for the degree of Bachelor of Arts or Bachelor of Science are eligible to compete.

Dimock Gallery Prize—Purchase award presented for creative achieve-nent in the fine arts.

Henry Grattan Doyle Memorial Prize—Established in memory of Henry Grattan Doyle, a former Dean of Columbian College. Awarded annually to n outstanding senior for excellence in Spanish.

Elton Prize—Established by the Reverend Romeo Elton, of Exeter, Eng-and, and awarded annually to the student with the highest average in the nost advanced course in the Greek language and literature.

Jesse Frederick Essary Prize in Journalism—Established by Helen Essary Murphy and awarded annually to a student who has given promise of ound citizenship and who submits the best printed and published evidence f ability in "forthright reporting" and good journalistic writing, in a stu-lent publication or elsewhere.

Jessie Fant Evans Prize—A bequest of Joshua Evans, Jr., in 1971, in ecognition of his wife's distinguished record at and service to the Uni-ersity, on whose Board of Trustees she served as the first woman member. Awarded annually to an outstanding senior student in a contemporary istory course.

Joshua Evans III Prize in Political and Social Science—A memorial prize established by friends because of an outstanding life." Awarded an-ually to that student in the graduating class "who has demonstrated his/er signal ability in the social and political sciences and who has given romise of the interpretation of that ability in good citizenship among his/er fellows."

Willie E. Fitch Prize—Established by James E. Fitch in memory of his on. Awarded annually to a senior student for the best examination in hemistry.

Charles E. Gauss Prize—Established in honor of Charles E. Gauss, lton Professor of Philosophy from 1945 to 1964. Awarded annually to a raduating senior for excellence in philosophy.

Alice Douglas Goddard Prize—A memorial established by Frederick oseph Goddard, of Georgetown, D.C. Awarded annually to the senior tudent making the highest average in American literature.

Edward Carrington Goddard Prize—Established by Mary Williamson oddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of eorgetown, D.C., in memory of Edward Carrington Goddard, class of 881. Awarded to the junior or senior student making the highest average the French language and literature.

Morgan Richardson Goddard Prize—A memorial established by Ma Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph Go dard, of Georgetown, D.C. Awarded to the junior or senior student maki the highest average in the following fields: business administration, ec nomics, international business, or public accounting.

Gardiner G. Hubbard Memorial Prize in United States History—Esta lished by Gertrude M. Hubbard in memory of her husband and award annually to that member of the graduating class majoring in history w has maintained the highest standing in courses in United States history.

International Business Prize—Two prizes awarded annually by t School of Government and Business Administration to students special ing in international business, one awarded to a graduating senior and o awarded to a graduate student.

David Lloyd Kreeger Prizes in Art—Five prizes given by Mr. Kreeg three in the fine arts and two in art history (including museology). Fi arts prizes are awarded to a senior or graduate student in painting, scu ture, graphics, design, ceramics, or photography. One prize in art histo is awarded to a senior and one to a graduate student. Candidates for t prizes must submit original papers or works of art. Winners are select by distinguished representatives of the field of art in the Washington, D. area.

Minna Mirin Kullback Memorial Prize—Established in 1968 by Solom Kullback in memory of his wife. Awarded annually by a committee faculty members of the Department of Statistics to a full-time und graduate or graduate student majoring in statistics, who will have co pleted 18 semester hours of statistics courses by the end of the spr semester.

John Francis Latimer Prize in Classics—Established in 1973. Award to a graduating senior who has made the most outstanding record a major in the Department of Classics.

Hilda Haves Manchester Prize in Sociology—Established in honor Hilda Haves Manchester, B.A. 1932, an outstanding student whose ma field was sociology. Awarded annually by Columbian College of A and Sciences to the senior student majoring in sociology who has highest scholastic record.

Vivian Nellis Memorial Prize—Awarded to a student in the English partment who has shown special promise in the field of creative writing

Phi Delta Kappa Prize—Awarded annually by the George Washing University Chapter to an outstanding senior in a teacher education p gram in the School of Education and Human Development.

Phi Delta Kappa Research Prize—Awarded annually by the Geo Washington University Chapter to a graduate student, for an outstand research project.

Phi Eta Sigma Prize—A choice book selected from the field of the cipient's major, awarded annually by the George Washington Univer Chapter to the student attaining the highest scholastic average in the full semester of work. The winner's name is engraved on a plaque in Office of the Dean of Columbian College of Arts and Sciences.

Pi Lambda Theta Prize—Awarded annually by Alpha Theta Chapter

an outstanding senior in a teacher education program in the School of Education and Human Development.

Psi Chi Prizes—Two prizes awarded annually by the George Washington University Chapter to the best undergraduate student in experimental psychology and to the M.A. degree candidate or second-year graduate student submitting the best thesis or research project in psychology.

Ruggles Prize—Established by Professor William Ruggles in 1859, awarded annually to a candidate for a bachelor's degree for excellence in mathematics.

The Jack and Anne Ryan Award in Health Services Administration—Awarded annually to that Health Services Administration student who displays excellence of analysis and writing skills in the preparation of a paper on a topic in health services administration.

Hermann and Johanna Richter Schoenfeld Prize—Established in grateful appreciation of the inspired teaching and devotion to his students of Dr. Hermann Schoenfeld, who for more than 20 years until his death in 1926 headed the Department of German. Hermann Schoenfeld, Ph.D., LL.D., was widely recognized as a scholar of distinction whose presence on the faculty added prestige to the University. This prize is given annually to a member of the graduating class for excellence in historical and cultural phases of German studies.

Julian H. Singman Prize—Awarded for creative achievement in the field of design.

Society of Colonial Wars in the District of Columbia Prize—A cash prize awarded to a candidate for a graduate degree who, in the judgment of the faculty of the Department of History, submits a thesis or dissertation demonstrating excellence in historical research in American Colonial history. The University reserves the right to withhold the award if no thesis or dissertation attaining the required degree of excellence is submitted.

Staughton Prize—Established by the Reverend Romeo Elton and awarded annually to the student making the best record in the most advanced courses in the Latin language and literature.

Alfred E. Steck Memorial Prize—Awarded for proven excellence in the field of sculpture.

James MacBride Sterrett, Jr., Prize—Established in 1911 by Professor Sterrett in memory of his son. Awarded annually to the student who obtains the highest average in Physics 1 and 2.

Charles Clinton Swisher Historical Club Prize—Established in 1936 by the Charles Clinton Swisher Historical Club and augmented in 1941 by the bequest of Professor Swisher. Awarded annually to the student who submits the best essay covering some phase of medieval history.

James H. Taylor Graduate Mathematics Prize—Established in memory of James H. Taylor, former Professor of Mathematics at the University. Awarded annually to a graduate student for outstanding performance in mathematics.

Patricia M. Toel Memorial Prize—Awarded annually to a graduate student in photography to recognize outstanding achievement.

Benjamin D. Van Evera Memorial Prize—Awarded annually to that Graduate Teaching Fellow in Chemistry selected as the most effective teacher during the current academic year.

The Wall Street Journal Leadership Prize—Awarded annually to a gra uating senior with a major field of study in finance within the Bachel of Business Administration degree, for outstanding academic performan and service to the University.

Thomas F. Walsh Prize—Established in 1901 and awarded annually the student who submits the best essay in Irish history.

The Washington Society of Investment Analysts Award—A $500 awa given to a full-time candidate for the Master of Business Administrati degree who is interested in finance and investments, has a high unde graduate academic record, and demonstrates financial need.

Alexander Wilbourne Weddell Prize—Established in 1923 by Virgin Chase Weddell in memory of her husband. Awarded annually to a degr candidate who writes the best essay on "the promotion of peace amo the nations of the world." The prize essays shall become the property the University and shall not be printed or published without the writt consent of the University. The University reserves the right to withhc the award if no essay attaining the required degree of excellence submitted.

Women's Transportation Seminar Prize—Awarded annually by t Women's Transportation Seminar to an outstanding student specializi in transportation in the School of Government and Business Administrati

REGULATIONS

Students enrolled in the University are required to conform to the follo ing regulations and to comply with the rules and regulations of the colle school, or division in which registered.

Students who withdraw or are suspended, or who, for any other reas are not registered at the University for one semester or more, may re-en and continue work only under the regulations and requirements in fo at the time of return.

If a student knowingly makes a false statement or conceals mate information on an application for admission, registration card, or any ot University document, the student's registration may be canceled. If su falsification is discovered after the student has established an acade record at the University, the student may be subject to dismissal fr the University. Such a student will be ineligible (except by special act of the Faculty) for subsequent registration in the University.

ATTENDANCE

Students may not attend classes until registration is completed and f due are paid. They may attend only those classes for which they registered. Regular attendance is expected. Students may be dropped fr any course for undue absence.

SCHOLARSHIP REQUIREMENTS

Students who fail to maintain the scholarship requirements of the college, school, or division in which registered may be dismissed from the University.

Grades

Grades are mailed to students through the Office of the Registrar at the close of each semester. They are not given out by instructors.

UNDERGRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal; *P*, Pass; *NP*, No Pass. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a grade of *D* or better was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate department chairman.

GRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *CR*, Credit; *F*, Fail; *I*, Incomplete; *IP*, Progress; *P*, Pass; *NP*, No Pass; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a grade of *C* or above was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

When another grade has not been assigned, the symbol *I* (Incomplete), the symbol *W* (Authorized Withdrawal), or the symbol *Z* (Failure because of unauthorized withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of Incomplete from student's record, consult the regulations of the college, school, or divisio concerned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtained b dividing the number of quality points by the number of semester hou for which the student has registered, both based on his or her record in th University. Quality points are computed from grades as follows: *A*, fo points; *B*, three points: *C*, two points; *D*, one point; *F* and *Z*, no points, fi each semester hour for which the student has registered. Courses mark *CR*, *I*, *IP*, *P*, *NP*, or *W* are not considered in determining the index, exce that courses marked *I* will be considered when a formal grade is recorde With the exception of Consortium courses, grades in courses taken other institutions are not considered in computing the quality-point index

Final Examinations

Final examinations for undergraduate courses are scheduled by the Offi of the Registrar. Examinations for courses numbered 201 or above a scheduled, if desired, by the individual department or instructor.

Academic Dishonesty

The University community, in order to fulfill its purposes, must establi and maintain guidelines of academic behavior. All members of the co munity are expected to exhibit honesty and competence in their acaden work. Incoming students have a special responsibility to acquaint the selves with, and make use of, all proper procedures for doing resear writing papers, and taking examinations.

Members of the community will be presumed to be familiar with proper academic procedures and held responsible for applying the Deliberate failure to act in accordance with such procedures will considered academic dishonesty. Acts of academic dishonesty are a leg moral, and intellectual offense against the community and will be pro cuted through the proper University channels.

Copies of the University policy on academic dishonesty can be tained from the following officers: all department chairmen, all acade deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washing University are subject to the provisions of the *Statement of Stud Rights and Responsibilities* which outlines student freedoms and respon bilities of conduct, the Judicial System for Non-Academic Student D cipline, and other policies and regulations as adopted and promulgated appropriate University authorities. Copies of these documents may obtained at the Office of the Vice President for Student Affairs. Sanctio

or violation of these regulations may include permanent expulsion from he University which may make enrollment in another college or university ifficult. Regulations or requirements applicable only to a particular pro- ram, facility, or class of students may not be published generally, but uch regulations or requirements shall be published in a manner reason- bly calculated to inform affected students.

VITHDRAWAL

Vithdrawal from a course or from the University requires the permission f the dean of the college, school, or division in which the student is regis- ered. Permission to withdraw from the University will not be granted a tudent who does not have a clear financial record (see "Payment of ees").

Each college, school, and division of the University sets deadline dates or each semester concerning withdrawal. Withdrawal between these dates nd the end of the semester is permitted only in exceptional circum- tances.

All charges for courses dropped without the approval of the dean must e met by the student. Such unauthorized withdrawal will result in the ecording of a failing grade for the course or courses.

HANGES IN PROGRAM OF STUDY

hanges within a College, School, or Division—A student may not sub- itute one course for another, drop courses (see "Withdrawal" above), hange status from credit to audit or from audit to credit without the ap- oval of the dean of the college, school, or division in which registered.

Change from one section to another of the same course may be made ith the approval of the dean and the department concerned.

Change from one major field to another within the same college or hool may be made with the approval of the dean.

Transfer within the University—Application for transfer to another col- ge, school, or division must be made to the appropriate admitting office n the form provided by the deans concerned. Transfer from the appro- iate preprofessional curriculum in Columbian College to bachelor's de- ee candidacy in the School of Public and International Affairs may take ace upon the completion of 60 or more semester hours of course work d of the necessary procedures required by the particular school.

With the exception of the School of Government and Business Admini- ation which limits a student to 15 semester hours earned in non- triculated status, a maximum of 45 semester hours earned in the vision of University and Summer Students may be applied toward a chelor's degree in the other degree-granting colleges or schools of the iversity. Work done in the Division of University and Summer Students ll not be counted toward a graduate degree unless prior written approval, tained from the relevant degree-granting college or school, has been filed the Office of the Dean of the Division of University and Summer udents.

Students transferring within the University are advised to study ca fully the requirements listed below under the heading "Graduation R quirements," and to note that, unless otherwise specified, in all und graduate divisions, 30 semester hours, including at least 12 semester hou in the major field, must be completed while registered in the school college from which the degree is sought. Upon transfer the student shou consult the dean concerned and understand clearly the requiremen which must be fulfilled.

CREDIT

Credit is given only after registration for a course and satisfactory comp tion of the required work, or upon the assignment of advanced standi in accordance with the regulations of the several colleges, schools, a divisions.

Auditing—A person who has been admitted to the University may registered, with the permission of the instructor, as an auditor in a cl (no academic credit). An auditor is not required to take active part or pass examinations. A student who takes a course as an auditor may repeat it later for credit.

POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so earn toward graduation from this University, must first secure the written proval of their dean. In no event will credit in excess of what might earned in a similar period in this University be recognized.

BALANCE SHEET

On request, the Office of the Registrar will issue to undergraduate deg candidates a balance sheet showing the amount of work completed and requirements remaining to be met for the degree. A second balance sh is issued only if the student changes major or degree objectives.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of student or former student who has paid all charges, including any stud loan installments, due the University at the time of the request. A fee $2 is charged for each transcript. When more than two transcripts ordered at the same time, a $2 fee is charged for each of the first transcripts and a $.50 fee is charged for each additional transcript. Par transcripts are not issued.

CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be continuou enrolled and actively engaged in fulfilling the requirements for the deg

each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned by the dean to inactive status (see below) he or she must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit of the degree, he or she may petition the dean for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave of absence.

INACTIVE STATUS

Under the regulations established by each school and college, a student may be considered in continuous pursuit of the degree while not enrolled in courses at the University when engaged in the following: cooperative engineering work semester; "year abroad program"; attendance at another institution with prior approval to have work transferred back to the GW program; completion of outstanding work in courses in which a grade of "Incomplete" was received; or non-course instructional activities unique to the particular school or college.

Students must request to be enrolled in inactive status, in advance of the year or semester concerned, and be granted approval by their dean for the specific activity desired. This status is generally limited to one year; no fees are assessed students while in this status.

GRADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended by the Faculty for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence and other requirements for the degree for which registered; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship—The student must meet the scholarship requirements fo the particular degree for which registered.

Curriculum—Minimum curriculum requirements for each degree ar stated under the college or school offering work in preparation for th degree.

Residence—Unless otherwise specified, in all undergraduate division of the University, a minimum of 30 semester hours, including at least 1 hours in the major field, must be completed while registered in the schoo or college from which the degree is sought. This requirement applies t students transferring within the University as well as to students trans ferring from other institutions. Unless special permission is granted b the dean of the college or school concerned to pursue work elsewher the work of the senior or final year must be completed in the college o school from which the degree is sought.

The graduate student must meet the residence requirements for th particular degree for which registered.

Attendance and Conduct—The University reserves the right to refus to confer a degree upon a candidate whose attendance or conduct has bee unsatisfactory.

Thesis or Dissertation—A thesis or dissertation submitted in partia fulfillment of requirements for a degree must be presented in its fina form to the dean of the college or school concerned no later than the dat specified in the University Calendar.

Accepted theses and dissertations, with accompanying drawings, be come the property of the University and are deposited in the Universit Library, where the duplicate copies are bound and made available fo circulation. See the appropriate college or school in this bulletin fo regulations governing theses and dissertations.

HONORS

WITH DISTINCTION

In all undergraduate divisions of the University a baccalaureate degre may be conferred "With Distinction," at the discretion of the faculty, if student meets the specific requirements of the college or school as follow

1. Columbian College of Arts and Sciences or School of Public an International Affairs—the attainment of the grades of *A* in 60 per cent o the courses taken at GW; or
2. School of Education and Human Development or School of Govern ment and Business Administration—the attainment of a quality-point inde of 3.50 or higher in all course work taken at GW.

To be eligible a student must have completed at this institution at leas one-half of the courses required for the degree.

SPECIAL HONORS

Special Honors may be awarded by the faculty to any member of th graduating class for outstanding achievement in the student's major fiel

on recommendation of the major department. The student must fulfill all of the following requirements:

1. Candidacy for Special Honors must be approved by the faculty member representing the major department or field not later than the beginning of the senior year.
2. Such other conditions as may be set at the time the candidacy is approved must be met.
3. At least one-half of the courses required for the degree must have been completed at GW.
4. The specific requirement of the college or school in which registered must be fulfilled, as follows: (a) Columbian College of Arts and Sciences or the School of Public and International Affairs—grades of *A* or *B* in 50 per cent of the courses taken at GW; or (b) the School of Education and Human Development or the School of Government and Business Administration—a quality-point index of at least 3.0 on all course work taken at GW.

THE LIBRARY

All students registered in the University have the privilege of using the University Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 14 days. Any book which circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open, except that they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except as provided by the Act and except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violations of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

ASSOCIATIONS AND SERVICES

CONSORTIUM OF UNIVERSITIES OF THE WASHINGTON METROPOLITAN AREA, INC.

The universities in Washington, D.C.—American University, Catholic University of America, George Washington University, Georgetown University, Howard University, and the University of the District of Columbia—are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (such as music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the announcements of programs of all the participating institutions. See page 28 for information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar of the institution in which the student is enrolled. Students register and pay tuition at their own institutions for all Consortium courses; course fees are payable to the visited institutions.

THE READING CENTER

Director F.E. Hesser

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school and college students as well as other adults. Instruction is available on an individual, semi-individual, and small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

Fees—Individuals should contact the Center regarding the fee schedu
All fees are payable in advance at the Reading Center, Building C, Su
429, 2201 G Street, N.W.

THE SPEECH AND HEARING CLINIC

Director of Speech-Language Pathology and Audiology J.W. Hillis

The Speech and Hearing Clinic offers diagnostic and remedial work f
children and adults with such communication difficulties as stutterin
lisping, cleft-palate speech, and cerebral-palsied speech; and with voic
articulatory, and hearing problems. Diagnostic and remedial work is al
available for persons with nonstandard language usage due to such co
ditions as hearing loss, neurological impairment, mental retardation, a
environmental factors.

CONTINUING EDUCATION FOR WOMEN

Continuing Education for Women Center, College of General Studies, Su
621-24, Gelman Library, offers individual and group counseling servic
including career and life planning, academic advising, and interperson
skills, as well as credit and noncredit courses, evening year-long certifica
programs for legal assistants, landscape architect assistants, publicati
specialists, administrative managers, supervisory specialists, and fu
raising administrators, and on-site seminars or workshops designed to me
the special needs of government agencies, associations, and business
Brochures are available.

ENGLISH FOR INTERNATIONAL STUDENTS

Director G.R. Bozzini

This is a comprehensive program in English as a foreign language, d
signed to serve members of Washington's international community wis
ing either to enroll in University credit programs or to improve their co
mand of English through an intensive or semi-intensive study program.
general, students must have completed the equivalent of an Americ
college-preparatory high school education.

Courses are offered at various levels of proficiency covering both or
and written communication and are scheduled in 14-week sessions duri
the fall and spring semesters and for two 10-week sessions during t
summer. Students entering the program will take a battery of tests to d
termine their levels of proficiency for placement in English and academ
programs. Registration for the tests is held in advance at the Office
English for International Students, Park Lane Building, Room 120, 20
Eye St., N.W., Washington, D.C. 20052. A $10 testing fee is charged ea
student.

Persons writing from outside the United States and needing a stude
visa will be considered for an I-20 certificate of eligibility for student vi
validation upon submission of TOEFL or ALIGU test results. Those i
terested in applying for a degree program should see pages 26-27 f
additional information.

CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING

Director F. William Rambo

The Center for Academic and Administrative Computing is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week, to all faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The Center operates an IBM 3031 (OS/VS1) central processing unit and a PDP 11 minicomputer which provides terminal and card remote-job-entry (RJE) to the 3031 for students. There is a full range of compilers and application software packages.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

ALUMNI RELATIONS OFFICE

Director Sandra Lear Phipps

The Alumni Relations Office, in conjunction with the General Alumni Association, makes available to alumni and their families an annual program of services and educational and cultural events.

Alumni are encouraged to inquire about available services and programs at the Alumni Relations Office, and to keep the Office informed of any changes in address or occupation.

The Alumni Relations Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

GENERAL ALUMNI ASSOCIATION

President William M. Porter

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University.

The affairs of the Association are directed by a Governing Board, the majority of whose members represent the constituent alumni organizations of the University's schools and colleges.

The voluntary leadership of the Association works closely with the staff of the Alumni Relations Office in carrying out Association affairs. The Association may be contacted through the Alumni Relations Office.

VETERANS BENEFITS

The Veterans Counselor's office, located on the third floor of Rice Hall, 21A Eye St., N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

ROTC

George Washington University students may enroll in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment office at one of these universities. Credit for such courses may be transferable to George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

STUDENT LIFE

Vice President for Student and Alumni Affairs William Smith, Jr.
Assistant Vice President for Campus Life John Perkins

The Office of the Vice President for Student and Alumni Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Services, Services for Students with Disabilities, Student Activities, Student and Alumni Career Services, and Student Health Service. The Office of the Vice President for Student and Alumni Affairs is also responsible for programs and services for alumni through the Office of Alumni Relations.

FFICE OF THE DEAN OF STUDENTS

ean of Students Gail Short Hanson
ssistant Dean of Students Cheryl Beil

he Office of the Dean of Students provides counseling and information or students, and assists in program development for the Division of Student Affairs. Staff members are well-informed on University policies and ie various student services provided on campus, enabling them to provide eferrals and answers to many questions concerning general student life. ersonal letters of recommendation for students applying to graduate nd professional schools can be obtained from this office. The Dean f Students is responsible for the services and programs offered by the ounseling Center, Educational Opportunity Program, International Services, Services for Students with Disabilities, Student Health Service, and ie Student and Alumni Career Services Office. The Dean of Student's ffice is located on the fourth floor of Rice Hall.

ounseling Center

irector E. Lakin Phillips
ssistant Director Diane DePalma

he Counseling Center works to enable students to overcome obstacles hich hamper learning. The Center's services are offered to students and aff, and include (1) resolution of the individual's educational, vocational, personal conflicts through short-term individual or group counseling, ocational testing, or study skills training; (2) training of graduate udents, resident assistants, and paraprofessionals; (3) consulting on ental health topics; and (4) development of new methods and programs aid student growth, such as counseling through written communication, deotaped counselor skills training, and interpersonal skills workshops. The Center administers the Miller Analogies Test, admissions testing, id special assessments for business and industry. Through its Office of ommunity Services, the Counseling Center also provides vocational counling and educational programs to the greater Washington community.

Students may request a cost-free interview from 9 a.m. to 4:30 p.m., onday through Thursday, and from 1 to 4:30 p.m. on Fridays. If the udent decides to continue, a modest fee per appointment will be charged r short-term treatment. If a test battery is called for, an additional $16 aterials fee will be charged. Fee adjustments can be made if financial eed is a factor.

The Counseling Center is located at 718 21st St., N.W.

ternational Services Office

rector Patricia McMillen
ssistant Director Linda Finkel

cated in the International House at 2129 G St., N.W., the staff of the ternational Services Office provides advising and counseling in matters personal and academic concern and visa regulations. This office is also consultation, information, and resource center for the University's inrnational population.

Educational Opportunity Program

Director Ronald Whitmore
Assistant Director Marquita Green

The Educational Opportunity Program is designed to provide selected D
trict of Columbia high school graduates and other qualified District r
dents with financial and personal support as well as academic assistanc
help them pursue undergraduate degree work at George Washington U
versity. The Program Office is located at 2127 G St., N.W.

Services for Students with Disabilities

Director Linda Donnels

The Director of Services for Students with Disabilities works to assure t
the special services necessary for handicapped students to participate fu
in their academic programs and the extra-curricular life of the campus
provided for them through University or community resources. This serv
is located on the fourth floor of Rice Hall.

Student and Alumni Career Services Office

Director Gordon Gray
Assistant Director Cynthia Gurne
Counselor Barbara Fitzgerald-McClain

The Career Services Office provides career guidance and placement
sistance to GW students and alumni. Some of the specific services
full-time and part-time job vacancy lists, career counseling, programs
job-seeking skills, a resource center of literature on occupations and
ployers, and current information on government employment includ
testing dates and application forms. Seniors and alumni may also use
office to establish credential files for application to graduate schools
for employment. The office is located at Woodhull House, 2033 G St., N.

Student Health Service

Director Mary Capon, M.D.

The Student Health Service is an outpatient clinic located in the H
Burns Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practitioners,
physician's assistants who are capable of addressing most of stude
medical problems. Visits are cost-free and may be either arranged by
pointment or, during certain hours, secured on a walk-in basis. M
routine laboratory tests may be performed in the Health Service lab
cost, many common medications are stocked to fill students' prescriptio
and allergy shots and immunizations are administered by the staff nu
for a minimal charge. A psychiatrist works in the Health Service to as
students with mental health concerns.

For serious emergencies occurring during hours when the Stud
Health Service is closed, students may go to the Emergency Room of

Jniversity Hospital for treatment. This arrangement is for emergency are only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to eceive treatment at the Student Health Service. Students enrolled in the College of General Studies and Continuing Engineering Education Program are not eligible. Students who so desire may engage physicians and urses of their own choice, but these students will be responsible for all ees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and eferrals to specialists or other outside physicians) are the responsibility f the student.

IEALTH AND ACCIDENT INSURANCE

The University has arranged for and endorsed group health and accident nsurance, on an elective basis, for those students who do not have other overage. Interested students should contact the Student Health Service r Office of the Dean of Students.

HOUSING

Director of Housing Ann Webster
Associate Director David McElveen
Assistant Directors Marilyn Mundy, Kathleen Jordan

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University also may be obtained at this Office.

Admission to the University does not include a room reservation. The tudent will receive, with the notification of acceptance, University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge or held as a security deposit on an apartment. Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall emester.

981-82 Residence Hall Rates Per Person for Two Semesters*

or Men:

Calhoun Hall

double room	$1,520
triple room	1,470

or Women:

trong Hall

single room	1,650
double room	1,520
triple room	1,470

*Residence hall prices and allocation subject to change.

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—
double room 1,

Everglades Hall (limited to juniors and seniors)—
apartment for two persons .....1,780 or 1,
apartment for three persons 1,

Building JJ (limited to sophomores, juniors, and seniors)—
apartment for 4 or 6 persons 1,

Francis Scott Key Hall (limited to juniors and seniors)—
apartment for two persons 1,
apartment for three persons .....1,690 or 1,

Madison Hall
double room 1,
triple room 1,

Milton Hall (limited to juniors and seniors)—
apartment for two persons .....1,780 or 1,
apartment for three persons 1,

Mitchell Hall (limited to sophomores, juniors, and seniors)—
single room 1,

Munson Hall (limited to juniors and seniors)—
apartment for two persons .....1,780 or 1,
apartment for three persons 1,

Thurston Hall
double room, triple room, room for four 1,
suite for six 1,

Food Service

Resident freshmen and sophomores are required to choose one of t following three food service plans: the seven-day, 19 meals per we plan, at the rate of $1,360* for the academic year; the any 14 meals p week plan for $1,310* for the academic year; or the any 10 meals per we plan at $1,250* for the academic year. Participation in the food servi plans is optional for junior, senior, and graduate students. Food servi payment does not cover University intersession or vacation periods. S meal cards admit bearer to dining rooms in Thurston and Mitchell Ha and to the second-floor contract dining room in the Cloyd Heck Mar Center. Meal cards may also be used on a cash equivalency basis in Marvin Center first-floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to make rangements with the George Washington University Housing Office garding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Guthridge Apartments

This apartment house is a University-owned, commercially operated buil ing within the campus area. It contains efficiency and one-bedroom un which are rented only to full-time graduate students on an "as availabl

* Food service prices subject to change.

asis. Referrals to the resident manager of this building are made by the)irector of Housing when notice is received of vacancies. Leases are xecuted with the management company and are on a month-to-month asis.

LOYD HECK MARVIN CENTER

)irector Boris Bell
Assistant Director Donald Cotter

he Cloyd Heck Marvin Center serves as the campus community center, roviding services, conveniences, and recreational and social opportunities or students, faculty, staff, alumni, and guests. Its wide range of facilities rovides the setting for a variety of programs conducted by the University rogram Board; by the departments of drama, dance, and music; and by ther student and faculty organizations.

The Center Governing Board, representative of all segments of the Uniersity community, plays an important role in the functioning of the enter by working closely with the full-time staff in the development of rocedures and policies which provide a framework for the Center's peration.

TUDENT ACTIVITIES OFFICE

)irector Claudia Derricotte
Assistant Directors Gary Salussolia, Randall Mason

he Student Activities Office assists individual students and organizations n program development, campus leadership development, and participation n special projects, both within the University community and the comnunity at large. The Office serves as a clearinghouse for activities inforation, registers and advises student organizations, and informs the Uniersity community of activities and programs through monthly and annual ublications. The Student Activities Office is also responsible for coordiating the orientation program for new students, and for planning supplenental development programs for graduate and undergraduate students. tudents who want to participate in the extracurricular phases of Univerity life should acquaint themselves with the facilities and staff of the tudent Activities Office.

Additional information about the numerous student organizations and ommittees is contained in the *Student Handbook*, compiled by and availble at the Student Activities Office in the Marvin Center.

tudent Government

he George Washington University Student Association is comprised of ll full-time and part-time graduate, professional, and undergraduate stulents who are registered for academic credit on campus. A body of elected nd appointed individuals is responsible for representing the interests of tudents at the University. The Student Association provides various ervices for students such as an academic evaluation, a student directory,

and the Student Advocate Service. Further information can be obtain from the Student Association offices in the Marvin Center.

Student involvement in the governance of the University is also possi through participation in various administrative and Faculty Senate co mittees, advisory councils of the schools and colleges, selected committ of the Board of Trustees, and specialized bodies such as the Reside Hall Association, the Joint Food Services Board, and the Marvin Cen Governing Board. This involvement has helped develop policies and p grams beneficial to students and to the total University community.

Student Organizations

Students are encouraged to become involved with existing student ganizations or to initiate their own. There are approximately 160 orga zations on campus covering a broad spectrum of interests including a demic, professional, international, cultural, political, service, sports, h bies, recreational, religious and meditative, as well as social fraternit and sororities.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the l of its students and encourages them to participate in the various religio organizations of their own choice. Catholic, Jewish, and Protestant bod sponsor various groups and form a link between the University and t religious community. The advisors of the religious organizations are ava able for counseling. Religious services and special observances are a provided for the University community as announced.

MAJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally kno artists is shown in monthly exhibits in the Dimock Gallery in Lisner Au torium and in the art gallery of the Cloyd Heck Marvin Center. With t cooperation of the Curator of Art, an annual student art exhibit is p sented.

Concert Series—The Department of Music presents a series of conce featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, inform studio performances, experimental events, television appearances, a lecture-demonstrations. Students may audition to become company me bers and have the opportunity to choreograph, perform, and gain expe ence in the technical aspects of dance productions.

International Programs—The International Student Society presents annual International Dinner in cooperation with foreign embassies a international restaurants. Other programs include regular forums a speakers on international topics.

Orchestra and Chorus Concert Series—The University Orchestra a Chorus are two facets of the lively arts available to students either

edit courses or as extracurricular activities. The Chorus presents major rformances to the University community three or four times a year, in- uding regular winter and spring concerts. The University Orchestra pre- nts several performances annually.

Program Board—The University Program Board, composed chiefly of ected and appointed students, is given primary responsibility and re- urces for student programming on campus. Through its various com- ittees, and in cooperation with other campus groups, it regularly sponsors ms, lectures, concerts, social activities, and special events.

Theater—The University Theater produces four or five major plays and usicals during the year on the proscenium/thrust stage in the Dorothy etts Marvin Theatre or in Lisner Auditorium. Additional works, including iginal and experimental plays, are produced in a more intimate studio eater. Students have the opportunity to participate in all aspects of eater and may receive credit toward their B.A. or M.F.A. degrees for me of their production work.

THLETICS, INTRAMURAL SPORTS, AND RECREATION

he Charles E. Smith Center for Physical Education and Athletics offers any facilities for student use, including courts for basketball, volleyball, d badminton; a jogging track; a swimming pool; wrestling, gymnastic, d weight rooms; handball and squash courts; and a sauna and lockers. ased in the Smith Center, the men's and women's athletic departments fer a broad program of intramural and recreational activities designed accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Associa- on, the Eastern College Athletic Conference, the Association for Inter- llegiate Athletics for Women and the Eastern Association of Inter- llegiate Athletics for Women. Its varsity teams compete against major niversities throughout the Midwest and Eastern Seaboard in such sports basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming d diving, squash, badminton, volleyball, and gymnastics.

COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Dean C.D. Linton
Assistant Deans B.J. Dunham, R.E. Knowlton, G. Ludlow, R.C. Rutledge

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*The Dean of Columbian College is an ex officio member of all committees; all listed committee embers are elected by the Faculty of Columbian College.

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Dean of Columbian College of Arts and Sciences, and the Dean of the Graduate School o
and Sciences are *ex officio* members of the Council.

TRODUCTION

ıce its founding in 1821, Columbian College of Arts and Sciences, the eral arts college of the University, has continued to expand and develop th the city of Washington. Its central situation makes participation in e life of the nation's capital convenient for resident students. The cos- ›politan nature of the student body reflects the atmosphere of a great ›rld capital. Because the students come from the 50 states and from 0 foreign countries, class discussions and casual student conversations e enriched by a challenging variety of viewpoints.

The Columbian College program is a contemporary application of the toric liberal arts tradition. Its purpose is to enable the student to de- lop both particular abilities and general awareness as a human being. demands of the student a thorough acquaintance with one major area learning and at the same time an understanding of how that specializa- n fits into the larger context of the scientific, social, and moral problems ıich confront modern society. It stresses a broadly enlightened per- ective which encourages its graduates to grow through the years in ility and wisdom.

Throughout its history, the College has kept pace with, and often led, ›vements of reform in higher education. Sensitive to the rapidly chang- patterns of student and social needs, notably the increasing maturity d knowledge of the modern incoming freshman, the College has from ıe to time inaugurated major changes in its academic programs. In ef summary, present patterns are designed to (1) permit the able student earn the baccalaureate degree in less than the standard four years, either earning credit through a wide variety of examinations or by performing h excellence within a 90-semester-hour three-year program; (2) provide ch student with a greater opportunity to design an individual academic ›gram by eliminating almost all specific course requirements except in major field; (3) encourage an early and close association between the dent and individual faculty members in the field of the student's chief erest; and (4) foster a spirit of community and shared responsibility ween faculty and student.

Opportunities exist for double majors (and minors) within the College; erdisciplinary programs; and, in the case of the student who finds no sting major or program suitable to individual educational goals, special erdisciplinary programs which may be developed by the student, in con- tation with departmental advisors and with the final approval of the mmittee on Curriculum.

Columbian College offers programs leading to the degrees of Associate Arts, Bachelor of Arts, and Bachelor of Science; prelegal and pre- dical programs; and the first two years of the professional programs ›ublic and international affairs.

Columbian College has degree-granting authority over certain programs ich combine on-campus and off-campus courses. These include the chelor of Science degrees in Geodesy and Cartographic Science. As st of the courses in the first two years of these programs are offered campus, students may be admitted as full-time on-campus students Columbian College. After the first 64 hours, most of the courses are ›red at off-campus locations. Students are then required to register

for their course work with the College of General Studies, which admi
ters off-campus programs. Students attending off-campus classes are
pected to provide their own transportation to and from class. Dista
involved vary from two to 20 miles from the campus area. Columbian
lege also has degree-granting authority over two other programs which
usually offered off campus and administered by the College of Gen
Studies: Associate in Arts in General Studies and Bachelor of Gen
Studies (areas of concentration in economics, history, mathematics, po
cal science, psychology, and sociology). For further information on
these programs, consult the College of General Studies.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the prog
of studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secon
school, showing at least 15 units* which must include four years of
lish; at least two years of one foreign language; two years of scie
preferably with laboratory instruction; two years of social studies, on
which must be American history; and one year of college prepara
mathematics beyond introductory algebra.
2. The principal's statement that the applicant is prepared to under
college work.
3. College Entrance Examination Board scores submitted on the S
lastic Aptitude Test.

It is recommended that the examinations be taken in Decembe
January. Scores on tests taken in the junior year may be submitted.
rangements for tests are the responsibility of the applicant and shoul
made with the Educational Testing Service, Princeton, N.J. 08540; or
Center Street, Berkeley, Calif. 94704, not less than one month before
date of the test. In applying for the test, the applicant should specify
the scores be sent to the Office of Admissions, George Washington
versity, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; how
the American College Testing battery scores will be accepted. The a
cant should request that these scores be sent to the Office of Admis
directly from the American College Testing Program, Iowa City, Iow
is recommended that the applicant take the tests in October of the s
year.

The Committee on Admission and Advanced Standing will con
the adequacy of the qualifications of an applicant who, because of un
circumstances, does not present all of the formal requirements stated
The Committee may prescribe appropriate scholastic-aptitude tests o
University. Students admitted with deficiencies in secondary s
units will be required to begin removing such deficiencies within the
year, by appropriate courses or examinations. Courses taken to

* A unit represents a year's study in a secondary school subject, including in the ag
not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

ıtrance deficiencies will not fulfill Columbian College meaningful initia-
on requirements as set forth on page 74, or distribution require-
ents prescribed by the School of Public and International Affairs.

EGULATIONS

egulations regarding admission, registration, fees and finances are stated
pages 20-32; other University regulations, on pages 44-52.

CHOLARSHIP REQUIREMENTS

CADEMIC WORK LOAD

encourage academic performance of high quality, the student's work
ad is limited.

A full-time student not on probation may take a course load of as much
17 semester hours. A student employed more than 20 hours a week who
not on probation may take not more than 10 hours.

The amount of work taken by a student on probation may be limited
the Committee on Scholarship.

A full-time student who, during the immediately preceding semester, has
ceived no grades below *B* and has earned grades of *A* in three courses
taling at least nine semester hours may take 18 or 19 hours. An employed
ident who, during the immediately preceding semester, has received no
ades below *B* and has earned grades of *A* in two courses totaling at least
semester hours may take 12 hours.

A student who accepts employment after registration or at any time
ring a semester must report that fact immediately to the dean so that
academic program may be adjusted, if necessary.

TENDANCE

e student is held responsible for all the work of the course in which
gistered, and all absences must be excused by the instructor in charge
fore provision is made for the student to make up work missed.

DDING AND DROPPING COURSES

ter registering, a student may add or drop courses only by means of an
icial "drop-add" form available in the Office of Columbian College.
ilure to drop a course may result in a failing grade. The deadline for add-
a course during the regular fall or spring semesters is the end of the
t week of classes. However, if the student presents a note from the in-
uctor explaining the special circumstances, and granting permission, a
ırse may be added up to the end of the second week of classes.

The deadline for dropping a course without academic penalty is the end
the fourth week of classes in the fall and spring semesters. The dead-
e for complete withdrawal from all courses without academic penalty
the end of the ninth week of classes. After the deadlines, program
anges require that the student present a petition to the Dean's Council.

USE OF CORRECT ENGLISH

The use of correct English, oral and written, is required in all cou
Any student whose English in any course whatever is deemed uns
factory may be reported by the instructor to the dean and to the
mittee on the Use of Correct English. The chairman of the Committee
assign supplementary work, without academic credit, varying in am
with the needs of the student. If the work prescribed is equivalent
course, the regular tuition fee is charged. The granting of a degree
be delayed by failure to make up any such deficiency in English to
satisfaction of the Committee and the dean.

DEAN'S LIST

The name of every student who takes a minimum of 15 semester h
(none of which may be in pass/no pass courses) in any one seme
who receives grades of *A* in at least 60 per cent of the course work t
in that semester, and who has no grades below *B* for that semeste
placed on the Dean's List for that semester.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to b
good standing.

The following rules governing probation and suspension are applic
as stated to students enrolled for a full-time program (12 semester h
or more) during the fall or spring semester. Students enrolled for less
12 semester hours during the fall or spring semester and students enr
during the summer sessions are subject to probation or suspension on
basis of their record for four courses (three or more semester hour
credit each), or multiples thereof, rather than on their record in any
semester.

Probation—A student who in one semester receives two failing gr
(*F* or *Z*) in courses carrying three or more semester hours of credit eac
the equivalent, is placed on probation. A student in the first semeste
probation who receives one failing grade in such a course will be
tinued on probation for a second semester. Two grades of *D* will be tre
as equivalent to one grade of *F* in determining probation. Any grades
or *F* replacing earlier grades of *I* will be considered a part of the record
the semester during which the *I* is removed. A student on probation ta
12 or more semester hours whose grades are all *C* or better is rem
from probation.

Suspension—The following cases constitute grounds for suspens
(1) three failing grades (*F* or *Z*) in courses carrying three or more sem
hours of credit, or the equivalent, in one semester; (2) two failing grad
such courses in the first semester on probation; (3) one failing grad
such courses in any later semester on probation. Two grades of *D* wi
treated as equivalent to one grade of *F* in determining suspension.

rades of *D* or *F* replacing earlier grades of *I* will be considered a part of ıe record for the semester during which the *I* is removed.

The minimum period of academic suspension is one fall or one spring emester. Final dates for applying for readmission are the same as those overning undergraduate admission (see page 20). A suspended student eeking readmission must submit evidence to the Committee on Admis- ion and Advanced Standing of conduct during absence from the Uni- ersity which indicates that the student will profit from readmission. A tudent suspended twice for poor scholarship will not be readmitted.

Mid-semester Warning—When, at the end of the sixth week of each emester, instructors file in the Office of the Dean the names of freshman nd sophomore students who are doing unsatisfactory work, a notice of varning is sent to the student and a copy filed with the appropriate ad- isor. A warning constitutes notice to the student to consult the instructor nd advisor at the earliest opportunity.

NCOMPLETE/AUTHORIZED WITHDRAWAL

onditions under which the grades of *I* (Incomplete) or *W* (Authorized Vithdrawal) may be assigned are described on page 45.

Removing an Incomplete—The grade of *I* must be removed no later than ıe last day of the examination period for the fall or spring semester im- ıediately following the semester or summer session in which the grade of is assigned. An "Incomplete" that is not removed within this period is utomatically changed to an *F*. In cases of well-documented extenuating ircumstances, an instructor and a student may jointly petition the dean, r the appropriate committee, for additional time in which to complete the ork of the course. Such petitions should be submitted within the same eriod. The grade of *I* cannot be removed by reregistering for the course ere, or by taking its equivalent elsewhere.

ORRESPONDENCE AND HOME-STUDY COURSES

lo credit is given for work done by correspondence or in home-study ourses.

LASSIFICATION OF STUDENTS

student becomes a *sophomore* upon completion of 30 semester hours, junior upon completion of 60 semester hours, and a *senior* upon com- letion of 90 semester hours.

An unclassified student is one who is not a candidate for a bachelor's egree (normally because the student already holds one), but who wishes or valid academic reason to take a limited program for a limited time. egistration in this status is permitted only with the prior approval of the ppropriate Dean's Council.

TUDY IN PARIS PROGRAM

tudents in good academic standing, who will be sophomores or juniors their proposed time of study abroad, may be eligible to participate in the

George Washington University–American College in Paris Study in P Program, either for an academic year or for a spring semester. Quali students will be encouraged to take this opportunity to profit from cultural and intellectual riches of Europe by spending a period of living and studying in Paris. The American College in Paris is the fully U.S.-accredited American college in Europe. Credits earned will transferable toward a degree in Columbian College of Arts and Scien subject to prior approval by the Study-Abroad Advisor in Columbian lege. A knowledge of French is desirable but not mandatory, as all cour except foreign languages and literatures, are taught in English. More formation may be secured from Assistant Dean Ludlow at the Office Columbian College.

INACTIVE STATUS

Students in Columbian College who wish to interrupt their studies apply to the dean for Inactive Status. They may apply at any time be the close of the registration period of the first semester for which status is desired. If approved, Inactive Status (for which no fee is charg assures the student for a period of one calendar year that re-entrance the College may take place under regulations prevailing at the time last registration. After the expiration of one calendar year of Inac Status, *or if the student has attended any other college or university ing absence from this University* (but see below), the student must fol regular readmission procedures and resume studies, if readmitted, un regulations then current.

Students who wish to attend another college or university, in country or abroad, during the period of Inactive Status may, by prior p tion to the dean, request approval of the planned program and, if appro is given, be assured of re-entry within one year under regulations p vailing at the time of last registration here.

LEAVE OF ABSENCE—See page 49.

ADVISORY SYSTEM

Each student is provided with both academic advising and personal co seling. *Academic* advising is performed by members of the faculty selec for their knowledge of academic programs, and each student, before re tration, makes up a program in consultation with the advisor assigned student who has *not* selected a major field receives academic advis from a member of the Columbian College Committee on Student Advi (see page 66). A student who has officially declared a major field rece academic advising from the appropriate department, or from an in departmental committee. *Personal* counseling is available through Office of the Dean of Students or through the University Counseling Cen All students are encouraged to maintain close contact with their advis

Students who intend to transfer after the sophomore year to the School f Public and International Affairs are assigned special advisors to assist hem in planning their programs.

An academic warning system permits early attention to students whose ork falls below required standards. In such cases, students are asked o consult regularly with their advisors. On request, and with the student's ermission, copies of academic warnings or probation notices may be sent o parents or guardians, who are themselves welcome to meet with mem- ers of the advisory staff.

CADEMIC ADVISING CENTERS

ach department has set up Academic Advising Centers where both gen- ral educational counseling and specific major-field advising are available o students. The locations and hours of these Centers may be obtained rom departmental offices.

As the freshman student deliberates choice of a major, he or she should onsult with faculty advisors in as many of these Centers as he or she ishes. Once a major is officially declared, the student then receives all cademic counseling from the Academic Advising Center of the major epartment.

EER ADVISING

o supplement academic advising by faculty members in Columbian Col- ge, peer advising is also available during fall and spring registration and he Summer Advance Registration Program. Undergraduate peer advisors, epresenting a broad range of major fields, are centrally located to offer cheduling help and course selection advice to fellow students. Peer dvisors are available to provide assistance throughout the academic ear. A roster of current advisors is published following each registration eriod.

ECLARATION OF MAJOR

he student is encouraged to select and officially declare a major field rly, normally no later than the end of the freshman year. All students, owever, whether they are entering freshmen or transfer students, must cure the advisor's signature on a proper form (obtainable in the Office of olumbian College), and return the form to the Office of Columbian College order to declare a major. No student is considered to have a major until is process is completed. Thereafter, the student receives academic guid- nce from a faculty advisor in the major-field department.

In most cases, filing of the approved declaration form assures the udent of admission to the major declared; however, if space, equipment, other requirements compel a department or major program to limit e number of students in that major, admission to the major may be on selective or space-available basis.

COLUMBIAN COLLEGE GENERAL COURSE REQUIREMENTS

All candidates for the degree of Bachelor of Arts or Bachelor of Scie are admitted to a general arts and sciences curriculum until they decl a major field. Except for two general course requirements, all curricul requirements leading to the degrees of Bachelor of Arts and Bachelor Science are established by the various major field departments or p grams.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequ achievement in English Composition, either by examination or by tak Engl 9 or 10, and Engl 11 or 12. This requirement may not be postpon

2. Each student at some point in the college career must undertak meaningful initiation into the three divisions of knowledge: humanit natural and mathematical sciences, and social sciences. As each ma field will normally represent one of these three areas, the requirement m be fulfilled by taking no less than six semester hours in each of the ot two areas. These six credits may be in approved introductory courses, in approved advanced courses if the student is qualified and receives instructor's permission. Courses taken to clear entrance deficiencies do satisfy meaningful initiation requirements. Applied and tool courses do satisfy the requirement for meaningful initiation into the humanit All science courses taken in fulfillment of the meaningful initiation quirement must include laboratory instruction. Normally, these six-h units must be taken in a single subject or department. Courses sim waived (no credit assigned) cannot satisfy the meaningful initiation quirements.

It is recommended that courses taken to satisfy the meaningful initia requirement be selected from the following:

Humanities

Art 31-32, 71-72; Classical languages 71, 72, 108, 113; Chinese 163-164; Eng 51-52, 61-62, 71-72, 191-192; French 51-52, 60, 91-92; German 51-52, 103- Music 3-4; Philosophy 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172; ligion 9-10, 59-60, 21-22, or 23 and 9; Slavic languages 71, 91-92; Spanish 5 91-92; Speech and Drama 45, 49, 133, 143, 144, 165, 166, 173, 192.

Natural and Mathematical Sciences

Biology 3-4, 11-12; Chemistry 3-4, 11-12; Geology 1-2, 5 and 2, or 5 and Mathematics 31-32, 32-33, 41-42, 51-52, 53-54, 9-10, or any combination of upper-level math courses; Physics 1-2, 9-10; Statistics 51 and 97 or 105, 53 97 or 105, 91 and 97, or 111-12.

Social Sciences

American Civilization 71-72; Anthropology 1-2; Economics 1-2; Geogra 1-2; History 71-72, 39-40, 72 and 91, 40 and 91; Journalism 71-72, 111 and Political Science 1-2; Psychology 1 and 5, 6, 8, 22, or 29; Sociology 1 and 100-level Sociology course.

The following courses will not satisfy the meaningful initiation requirem Applied courses in art (also Art 1); applied courses in music and in speech drama (SpDr 1 and 11); English composition courses; basic (first- and seco year) foreign language courses; Math 3, 6, 30.

Required Placement Examinations

English—Students whose scores on either the Test of Standard Written English or on the English Composition Achievement Test suggest that they will benefit from more intensive training in compositional skills may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10. Students whose scores indicate superior competence will be allowed to waive the Engl 10 requirement.

Note: A diagnostic test in reading proficiency is required for students enrolled in Engl 9. For those whose test results show a reading deficiency, a noncredit reading course—given by the Reading Center—is required. The reading course meets three hours a week for a maximum of 10 weeks.

English for International Students—see pages 26-27.

Foreign Languages—A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination in one of the following: Chinese, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish. Upon completion of the examination, assignment is made to the appropriate course.

Mathematics—New students who wish to register in Math 30, 31, or 41 are required, prior to registration, to take a placement examination in algebra and trigonometry; those wishing to register in Math 51 are required, prior to registration, to take a placement examination in algebra.

Foreign Language Requirement

In most major programs requiring foreign languages a student must complete satisfactorily the equivalent of two years of college work in a single foreign language.

A student offering for admission four acceptable high school units of a single foreign language, or the equivalent, is not required to take any foreign language.

A student who offers less than four units and wishes to continue the same language must take the language placement test.

In many instances foreign languages are required or recommended as preparation for advanced work. The student should consult the advisor so that appropriate foreign languages may be included, when necessary, in the student's program.

First- and Second-Group Courses

First-group courses, those numbered from 1 to 100, are intended primarily for freshmen and sophomores. Second-group courses, those numbered from 101 to 200, are intended for juniors and seniors. However, a qualified freshman or sophomore may, with the permission of the advisor and of the department concerned, take second-group courses. Such qualification is achieved by passing or waiving introductory courses or prerequisite courses in the first group.

Courses in the Major Field or Department

Every student is given the opportunity of taking a wide range of li arts subjects—humanities, natural and mathematical sciences, s sciences—both as a means of laying the groundwork for more centrated major-field study and as a means of determining what acad area is best adapted to the student's interests and aptitudes. In ord enhance this opportunity and to avoid over-specialization once a m has been selected, the student must take at least 60 hours of course w including the general course requirements of Columbian College, ou the major-field department or major program. (This does not appl students in the 90-hour degree program.)

Professional Courses

Except for majors in applied mathematics and for students intereste teacher certification or intending to apply for the combined degre Bachelor of Arts and Doctor of Medicine, no more than 12 hours of fessional courses, e.g., courses offered in units of the University other Columbian College, may be included in the hours required for the ba lor's degrees in Columbian College. Students electing professional cou under this rule must obtain the approval of the dean before registrat

Human Kinetics and Leisure Studies

Courses in Human Kinetics and Leisure Studies are not required, are such courses generally acceptable for credit toward a degree. U prior petition to the dean, however, certain courses in dance as an form may be included in the 12 hours of professional credit permitted.

Experimental Humanities/Service-Learning Program

A maximum of 21 semester hours in any combination of Experime Humanities courses and Service-Learning Program courses may be cred toward bachelor's degrees in Columbian College.

Earning Credit By Examination

Assuming there is no duplication of course work earned, a maximu 30 semester hours of credit may be assigned for any combination of following:

College Entrance Examination Board Advanced Placement Tests—C may be granted for college-level courses taken in an approved secon school if substantiated by satisfactory performance on the Adva Placement Tests. See page 24 for further details.

College Entrance Examination Board College-Level Examination gram (CLEP)—Prior to matriculation, credit may be assigned for C General Examinations passed at the 50th percentile or above. Credit be assigned for any CLEP Subject Examinations passed at the level rec mended in the College Board model policy. A few examinations in categories, however, are unacceptable for credit. See pages 22-23 for cific exceptions.

After matriculation, credit for CLEP Subject Examinations will not be ssigned without special authorization by the Columbian College depart- ent governing the subject involved. See pages 22-23 for additional in- ormation.

Special Departmental Examinations—A student may request any depart- nent of Columbian College to offer a special examination covering the ubject matter of any specific course. (If an appropriate CLEP Subject xamination is available, the department may choose to employ it.) Ap- roval of such a request is not automatically granted; the student must ffer evidence of sufficient background to have a reasonable command of he subject matter. A student who has previously taken examinations to vaive course requirements may not subsequently take examinations for redit in the same courses. Assigning credit (or waiving a requirement) by pecial departmental examinations will depend on the department's evalua- ion of the examination paper. These examinations will normally be of at east three hours' duration. A fee of $25 for each course examination is harged for preparation, administration, and grading of the examination.

Vaiving Introductory Courses by Examination

Placement Tests—Many departments in Columbian College, including nglish, mathematics and all foreign languages, require students to take lacement tests to determine level of proficiency or eligibility for specified ourses. The student is placed in an appropriate course on the basis of hese tests. There is no charge to the student for placement tests, and no redit (advanced standing) is awarded for courses bypassed or waived as result of these tests.

Waiver Examinations—Several departments in Columbian College, in- luding English, history and sociology, offer periodic waiver examinations or introductory courses. Such examinations may be attempted at the ption of the student; a fee of $5 is charged. Specific departments should e consulted for further details. *Passing a waiver examination does not ntitle a student to any semester hours of credit.*

arning Additional Semester Hour of Credit

ormally, no deviation is permitted from the number of semester hours of edit given in parentheses after the title of each course. In exceptional rcumstances, however, and with the prior approval in writing of the structor and the dean, a student may register for and earn an additional mester hour of credit in certain appropriate second-group (upper- vision) courses by doing a significant amount of extra work as assigned d supervised by the instructor. This privilege is not applicable during the mmer Sessions.

EPROFESSIONAL REQUIREMENTS

dents who plan to major in any program offered by the School of blic and International Affairs are registered during the freshman and homore years in Columbian College. Requirements for the first two

years of these programs, as well as requirements for the premedical pr gram, are listed on the following pages.

Premedical Curriculum

A premedical student who intends to work toward a bachelor's deg fulfills the general requirements of Columbian College (see pages 74-7 and may follow the major field curricula of any Columbian Coll department. Each premedical program must be approved by the p medical advisor. For admission to most medical schools the student m have a minimum of 90 semester hours applicable towards a degree in approved college of arts and sciences; the 90 hours must include

1. *Biology:* eight semester hours. This may be either in general biologi zoology but may not include separately credited courses in botany.
2. *Chemistry:* eight semester hours of general inorganic chemistry (w may include qualitative analysis), including four semester hours of laborat and six to eight semester hours of organic chemistry, including laboratory
3. *Physics:* eight semester hours, including at least two semester hour laboratory.
4. *English:* six semester hours. This may be the usual introductory co course or its equivalent.

Many medical schools have additional entrance requirements, an which are courses in biochemistry, embryology, histology, genetics, mathematics. Even where such courses are not actually required, they strongly recommended.

With the exception of these specific requirements applicants are u to follow their personal interests in developing their premedical cou of study. A well-balanced program, rather than a specific field, is criterion by which an applicant is judged. It is not advisable to courses that appear to cover subject matter in the medical program.

While well-qualified candidates are eligible for admission after pleting the minimum 90 semester-hour requirement, the majority of a cants are found to be better prepared for the study of medicine after years of college work.

Preparation for Law School

The best undergraduate preparation for law school is a solid, b liberal education. Columbian College, therefore, does not prescribe a legal" curriculum. One of the Assistant Deans in the College, howev designated as Pre-Law Advisor, and students interested in legal st should consult him for information and guidance.

Chinese Language and Literature

The first two years in preparation for the Bachelor of Arts degree w major in Chinese Language and Literature in the School of Public International Affairs consists of a minimum of 60 semester hours. student must, during the freshman year, demonstrate adequate acl ment in English Composition, either by examination or by taking E or 10, and Engl 11 or 12. The student must also undertake a mean initiation into the three divisions of knowledge: humanities, natura

athematical sciences, and social sciences. As the major field represents ne of these three areas, the requirement may be fulfilled by taking no ss than six semester hours of approved introductory courses, or six emester hours in approved advanced courses if the student is qualified id receives the instructor's permission, in the natural and mathematical iences and in social sciences. Students must include in their program study Chin 1-2, 3-4, and 9; Chin 7-8 and 9; or Chin 5-6. Chin 5-6 is eferred.

ast Asian Studies, Middle Eastern Studies, or ternational Affairs Curriculum

rst two years in preparation for the Bachelor of Arts degree in the field East Asian Studies (China or Japan), Middle Eastern Studies, or Inter- tional Affairs in the School of Public and International Affairs:

		Semester Hours
English:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; *Literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60; or AmCv 71–72	6
†Language:	Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish	12–16
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; or one course selected from Stat 51, 53, 91, 111, and one course selected from Stat 97, 105, 112	6–8
ocial Science:	Econ 1–2; Hist 40 and 72; PSc 1, 2, and 91§	21
‡Elective:		6–12
	Total	60

olic Affairs Curriculum

st two years in preparation for the Bachelor of Arts degree in the field Public Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; *Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group Philosophy courses; Rel 21, 59–60; AmCv 71–72	6

a student elects six semester hours of literature in any foreign language, this cannot be used atisfy the language requirement.
in 5-6 is required for East Asian Studies (China focus) majors; Japn 3-4 is required for East n Studies (Japan focus) majors. Greek and Latin are not acceptable for International Affairs rs. Middle Eastern Studies majors may substitute other languages with the approval of the ram advisor.
edit is not given for courses elected in the Department of Human Kinetics and Leisure ies.
91 is not required for the Middle Eastern Studies program.

		Semester Hours
Language or Statistics:	NOTE: This requirement may be satisfied by two years of one foreign language* or 12 semester hours of statistics. Statistics courses taken to fulfill this requirement may not also satisfy the math/science requirement below.	
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; or one course selected from Stat 51, 53, 91, 111, and one course selected from Stat 97, 105, 112	
Social Science:	Econ 1–2; Hist 40 and 71–72; PSc 1 and 2	
†Elective:		
	Total	

Urban Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the fi of Urban Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	
Humanities or AmCv:	Art 31–32 or 71–72; Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60; or AmCv 71–72	
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10	
Social Science:	Econ 1–2, Hist 71–72, and PSc 2	
	Three semester hours selected from either Hum 40 or Soc 2	
†Elective:	Students may substitute some of the required courses for the major (see page 173) for elective courses during the sophomore year	1
	Total	

DEGREE PROGRAMS

ASSOCIATE IN ARTS DEGREE

The Associate in Arts Degree may be granted to a student who has co pleted 60 semester hours in arts and sciences with acceptable grades, who has fulfilled the general requirements described on pages 74-75. addition, the degree may be awarded to pre-public and international fairs students upon completion of the curriculum specified for the

* Greek and Latin are not acceptable for satisfying the foreign language requirement for P Affairs majors.

† Credit is not given for courses elected in the Department of Human Kinetics and L Studies.

vo years of the appropriate program. The last 15 semester hours of the rogram of study must be completed in residence in Columbian College. student wishing to receive this degree must file an Application for raduation and pay the $10 graduation fee at the time of registration for ie semester or summer session in which the requirements will be com-leted.

HE BACHELOR'S DEGREES

olumbian College offers programs leading to the degrees of Bachelor of rts and Bachelor of Science.

In cooperation with the School of Medicine and Health Sciences a even-year curriculum leading to the combined degrees of Bachelor of rts and Doctor of Medicine is offered.

For teacher certification for Columbian College students, see page 106.

equirements for the Degrees

CHOLARSHIP

)ne hundred and twenty hours of course work must be passed and a uality-point index of 2.00 achieved in courses graded on a four-point cale. At least 60 hours of course work, including the general course re-uirements of Columbian College, must be taken outside the major-field epartment or major program.

The index is obtained by dividing the number of quality points by the umber of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. 3oth the number of quality points and the number of semester hours of ourses are based on the student's record at this University. The index s computed as follows: *A*, four points; *B*, three points; *C*, two points;), one point; for each semester hour which the student has taken. Courses iarked *F*, *Z*, *W*, *I*, *IP*, *P*, or *NP* are not considered in determining the in-lex, though courses passed with *P* count toward the 120-hour overall re-uirement. (When a formal grade is recorded for an Incomplete, a grade f *D* or better will be included in the computation of the index.) A grade f Incomplete which is not removed within one semester is automatically hanged to an *F*. Grades earned in courses taken at another institution are ot considered in computing the index. At the time of graduation, a tudent must be in good academic standing. See page 86 for scholar-hip requirements applicable specifically to departmental majors.

ESIDENCE

'or the standard 120-semester-hour program—A minimum of 30 se-iester hours, including at least 12 hours in the major field, must be com-leted in residence in Columbian College. *Unless special permission is ranted by the dean to pursue work elsewhere, the work of the senior ear must be completed in residence.* This requirement applies to students ransferring within the University as well as to students transferring from ther institutions.

For the 90-semester-hour program—The last 60 semester hours, includ at least 12 hours in the major field, must be completed in residence Columbian College.

Summer work may be counted in residence. For regulations govern students who are absent from the University for one semester or m see "Leave of Absence" and "Inactive Status," pages 49 and 72.

CURRICULUM REQUIREMENTS

A change in degree candidacy within Columbian College (e.g., from Bac lor of Arts to Bachelor of Science) requires the permission of the de The degree requirements effective at the time the change is appro must be met.

First-group courses may be required as prerequisites to the major, because of their introductory character they cannot be counted as par such programs. (See "Explanation of Course Numbers," pages 194-95.)

PASS/NO PASS OPTION

A junior or senior student in Columbian College who is in good stand may, with the approval of the advisor and the dean, take one course a mester and receive a grade of *P*, Pass, or *NP*, No Pass. No student be allowed to take more than four pass/no pass courses under regulation. The student may, however, also receive grades of *P*/ in the proseminar for field-of-study majors and in other courses norm using such grades. A student must sign up for the pass/no pass op at registration. Under no circumstances may a student change fr pass/no pass status to graded status, or vice versa, after the end registration. Courses required in the student's major field (courses quired in the major department or those required outside the major partment) may not be taken on the pass/no pass basis. A transfer dent may not choose this option until the second semester of enrollmen this University.

TUTORIAL STUDY

A junior or senior of demonstrated capacity, with a special interest in subject matter of a regularly listed course, may be permitted to take torial study in residence under the personal direction of the instruct in accordance with the rules of the appropriate department and with approval of the dean. Credit under this plan is limited to the spec semester hours of credit designated for each course in the list of cour of instruction. It assumes frequent and regular conferences between student and instructor.

HE STANDARD 120-SEMESTER-HOUR PROGRAM

ne hundred and twenty semester hours of course work are required for raduation. At least 60 hours of course work, including the requirements tated on pages 74-75 and 81-82, must be taken outside the major depart- ent or program. The student should consult the advisor at each registra- on about choice of courses.

Each student should declare a major as soon as possible, preferably upon ompletion of 30 semester hours. A student may change the major with he consent of the dean and of the department or committee concerned; he student must meet the requirements for the new major in effect at he time the change is approved.

Students transferring from other institutions or from other schools, olleges, or divisions in this University, with major requirements wholly r substantially met, must satisfy the residence requirement of Columbian ollege (see pages 81-82).

HE 90-SEMESTER-HOUR PROGRAM

he 90-semester-hour degree program is designed for the exceptionally ble student. This program, which leads to the regular Columbian College egrees, makes it possible to graduate in three normal academic years vith a total of 90 semester hours of credit instead of the standard 120. tudents in this program must complete all of the requirements for the hree-year degree in the semester in which the 90th semester hour is chieved.

The requirements for this program are (1) 90 semester hours of credit arned in college courses (that is, the 90-hour requirement may not be re- luced by credit earned through examinations); (2) completion of the chosen najor-field program and general curricular requirements; (3) grades of *A* in t least 45 semester hours of course work and *no* grades below *C*; (4) at east 60 semester hours of credit earned in 100-level courses; and (5) rec- mmendation of the major department or program.

To be eligible for this program, the student must show evidence of ex- eptional academic ability by college record, performance in college ourses, and other appropriate information.

An interested student should make application directly to the major- ield departmental chairman or program director as soon as possible, preferably by the end of the first year of study. The student's academic ecord to that point will, of course, provide a useful criterion of eligibility.

A transfer student may qualify for graduation under the 90-hour program provided the student completes at least 60 semester hours of the approved 90-hour program in Columbian College, earns grades of *A* in no less han 45 semester hours of such course work at this University, and has no grades below *C*.

A student who fails to maintain the required academic performance while studying toward the 90-hour degree program simply continues for he standard 120-hour degree.

Bachelor of Arts

The Bachelor of Arts degree is offered in the following fields:

American Civilization
American Literature
Anthropology
Applied Mathematics
Applied Statistics
Art History
Biology
Botany
Chemistry
Chinese Language and Literature
Classical Archeology and Anthropology
Classical Archeology and Classics
Classical Humanities
Dramatic Art
Early Modern European Studies
Economics
English Literature
Environmental Studies
Fine Arts
French Language and Literature
General Curriculum in the Liberal Arts
Geography
Geology
Germanic Languages and Literatures
History
Journalism
Judaic Studies
Latin American Studies
Mathematical Statistics
Mathematics
Music
Philosophy
Physics
Political Science
Psychology
Radio-Television
Religion
Russian Language and Literature
Russian Literature and Culture—in Translation
Sociology
Spanish-American Literature
Spanish Language and Literature
Speech Communication
Speech Pathology and Audiology
Statistics (Computer Science option)
Zoology

Combined Degrees of Bachelor of Arts and Doctor of Medicine

A candidate for the combined degrees of Bachelor of Arts and Doctor Medicine must (1) complete the entrance requirements for the Doctor Medicine degree in the School of Medicine and Health Sciences; (2) co plete the general requirements stated on pages 74-75 and 81-82; (3) accur late 90 semester hours in the liberal arts, including a minimum of 30 second-group courses in Columbian College; (4) obtain the approval the Dean of Columbian College at the time of entering the School Medicine and Health Sciences; (5) obtain the recommendation of the D for Academic Affairs of the Medical Center at the completion of all p scribed courses in the first year of the School of Medicine and He Sciences, at which time the degree of Bachelor of Arts will be confer (professional work taken at another institution will not satisfy the ma requirement of the combined degrees); (6) maintain throughout the en course the scholarship level required for graduation.

Bachelor of Science

The Bachelor of Science degree is offered in the following fields:

Applied Mathematics
Applied Statistics
Biology
Botany
Chemistry
Environmental Studies
Geology
Geology (Engineering option)
Mathematical Statistics
Mathematics
Physics
Statistics (Computer Science option)
Zoology

he Undergraduate Major

here are two types of undergraduate majors: the Field-of-Study major nd the Departmental major. Five majors—Classical Archeology and Anropology, Classical Archeology and Classics, Environmental Studies, idaic Studies, and Latin American Studies—although interdepartmental nature, are governed by the regulations of the Departmental major.

IELD-OF-STUDY MAJOR

ach Field-of-Study major covers a carefully worked out field of coordiated study and is under the supervision of the appropriate department nd the Columbian College Committee on Curriculum.

The Field-of-Study major requires no specific program of courses, alough the student is required to meet the over-all general requirements r the degree. Ability to pass the Major Examination is assumed to be a nvincing demonstration that the student possesses the breadth, depth, nd quality of knowledge of the major usually defined in terms of semester ours, courses, and grades. Information on each field is obtainable from he department. Immediately upon declaring a major, students should conult the appropriate department so that they may be assigned an advisor.

The Field-of-Study major places special emphasis on the intellectual evelopment of the individual student. Programs in the same major may ary, depending upon the individual student's background, previous study, nd aptitudes. The student is expected to consult the advisor frequently, nd the special proseminars offered in some fields give the student further pportunity for individual advice and direction in pursuing a program specially adapted to individual needs and abilities. A close studentdvisor relationship is essential for the student's success under the ield-of-Study major plan.

The following Field-of-Study majors are offered: American Civilization, merican Literature, Chinese Language and Literature, English Literature, rench Language and Literature, History, Russian Language and Literature, ussian Literature and Culture—in Translation, Spanish American Literaure, Spanish Language and Literature.

Proseminar in the Major—A proseminar is offered in most fields to help he student acquire a coordinated knowledge of the chosen field through eading, study, and laboratory exercises. It is a presentation of the content nd methods of the major field as a whole through the organization and oordination of the knowledge obtained in the various formal courses in he major subject and of material not usually included in such courses. his course is not required, but, if it is elected, strict attendance is essenial. Six semester hours, but no qualitative grade, may be assigned. When egistered in this course, the student has the privilege of visiting, subject o the approval of the instructor, any other appropriate course offered in he College. (Regular attendance in a course, either for credit or as an uditor, requires registration and payment of tuition.) Proseminars are pen only to the student who has been accepted as a candidate under that pecific major.

The Major Examination—The Major Examination will normally be taken t the close of the senior year; a student on a limited schedule may take it

no earlier than one calendar year before graduation. A student who to pass a Major Examination may, at the discretion of the Committe Curriculum, be re-examined at a later regular major-examination pe The Committee on Curriculum has general supervision of the prepara reading, and grading of Major Examinations. Major Examinations are each semester on dates fixed by the department or departments concer but in no case later than December 1 for the fall semester, April 13 fo spring semester, and August 26 for the summer sessions.

DEPARTMENTAL MAJORS

Departmental majors, unlike Field-of-Study majors, are defined in term credit hours, required courses, and the attainment of grades no lower C in the minimum required second-group courses taken in the major f A *D* in a required course will satisfy a curricular requirement in the m but it will not count toward the minimum number of hours required in major. (A department may require a degree candidate to repeat a requ course in which a *D* was received. See page 45.) The minimum spe requirements for Departmental majors are listed below the staff of inst tion of the department concerned. The chairman of the department designated departmental advisor, should be consulted at registration c cerning the student's program of courses; and the entire program, inclu electives, must be approved by the department. The student is also pected to consult the chairman or advisor in all matters affecting the gram of studies, such as changes, substitutions, or withdrawals, and e cially concerning the student's progress in a course. A close stud advisor relationship is desirable.

Departmental majors are offered in the following: American Literat Anthropology, Applied Mathematics, Applied Statistics, Art History, ology, Botany, Chemistry, Classical Archeology and Anthropology (in departmental), Classical Archeology and Classics (interdepartmen Classical Humanities, Dramatic Art, Economics, English Literature, vironmental Studies (interdepartmental), Fine Arts, General Curriculu the Liberal Arts, Geography, Geology, Geology (engineering option), manic Languages and Literatures, History, Journalism, Judaic Studies terdepartmental), Latin American Studies (interdepartmental), Ma matical Statistics, Mathematics, Music, Philosophy, Physics, Polit Science, Psychology, Radio-Television, Religion, Russian Language Literature, Sociology, Speech Communication, Speech Pathology and diology, Statistics (computer science option), Zoology.

MINORS

Students who wish to familiarize themselves with a field outside th major may graduate with a minor in addition to the major. Not all Col bian College departments offer undergraduate minors; the requireme prescribed by those that do are printed under the name of the departm involved. A student interested in a minor should consult faculty advis in the department concerned and declare both major and minor progra on the appropriate form available in the dean's office.

DUBLE MAJORS

Vith the prior approval of the departments concerned, a student who mpletes the requirements of two major fields in Columbian College (for kample, mathematics and physics, or English and French, or history and conomics) may graduate with a double major. Such a student should nsult with advisors in the two departments concerned and officially eclare both majors on the appropriate forms available in the dean's ffice. A double major must be taken in departments offering the same egree (either the B.A. or the B.S.); a major field in Columbian College nnot be combined with a major field offered by another degree-granting nit of the University.

TERDISCIPLINARY PROGRAMS

Regular Interdisciplinary Programs—Several programs presently exist, cluding American Civilization, Classical Archeology and Anthropology, lassical Archeology and Classics, Early Modern European Studies, Envinmental Studies, Judaic Studies, and Latin American Studies.

Special Interdisciplinary Programs—A student who finds no existing ajor or program suited to individual educational goals may develop a pecial major program, in consultation with appropriate departmental adisors. Final approval of such a program rests with the Committee on Curculum. Only programs with valid and clearly defined academic goals will e approved, and each shall be designated by a title suggested by the tudent to the Committee on Curriculum for approval. At least 45 semester ours of credit of the approved program must be completed in Columbian ollege. Because of their broad scope, such interdisciplinary majors may ot be combined with a double major.

A student in an interdisciplinary program will be expected, during the econd semester of the senior year, to take a comprehensive examination ither oral or written) in the interdisciplinary field, or to undertake a senr comprehensive thesis, at the discretion of the student's interdepartental committee.

Special Interdisciplinary Courses—Under the supervision of the Comittee on Curriculum, new courses will be offered each semester combining ie methods and insights of several disciplines. Interested students should onsult the current *Schedule of Classes*, where they will find such courses umbered 701 and 721. These courses do not satisfy the requirement of eaningful initiation into the three divisions of knowledge (see Columbian ollege General Course Requirements).

General Curriculum in the Liberal Arts—Directed by the Curriculum ommittee of Columbian College of Arts and Sciences. The program is esigned to provide a general education in the liberal arts, with or without major, as the student chooses. It offers opportunity for achieving a subtantial acquaintance with each of the three divisions of knowledge rough a selection of courses that cultivate a broad perspective in time nd in national and/or cultural traditions. The committee appointed to dvise students in the program consists of one representative each from ie humanities, the social sciences, and the natural and mathematical ciences. For curriculum requirements, see pages 319-20.

GRADUATE SCHOOL OF ARTS AND SCIENCES

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Assistant Deans A.D. Andrews, E.A. Caress, D.A. Rowley, C.E. Rice

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* The President of the University, the Vice President for Academic Affairs, the Registrar of University, the Director of Admissions of the University, and the University Librarian are *officio* members of the Faculty of the Graduate School of Arts and Sciences.

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Rand, N.L. Sass, S.I. Shibko, J.W. Witherell

HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for advan
study and research leading to Master's degrees in the arts and scien
and the degree of Doctor of Philosophy. Graduate programs at Geo
Washington University were first formally organized under the Gradu
School in 1905, following several decades of gradual growth in a num
of departments. In 1930 the Graduate School was discontinued. Columb
College, the University's liberal arts college, then assumed responsibil
for the Master of Arts and Master of Science degrees, and a newly crea
Graduate Council administered all Doctor of Philosophy programs. P
fessional schools took responsibility for advanced degrees in the prof
sional fields.

In 1967 the Graduate Council and the Graduate Division of Columbi
College were consolidated into a new Graduate School of Arts a
Sciences. All graduate programs in the arts and sciences leading to t
degrees of Master of Arts, Master of Arts in Special Studies, Master
Fine Arts, Master of Forensic Sciences, Master of Music, Master of S
ence, Master of Science for Teachers, Master of Science in Foren
Science, Master of Science in Special Studies, and Doctor of Philosop
are under the Graduate School.

In addition, a Master of Philosophy degree is awarded by the Scho
upon recommendation of the appropriate department, to students wh
have successfully completed the General Examination for the Doctor
Philosophy degree.

The School is under the direction of the Graduate Faculty of Arts a
Sciences. It is the responsibility of the Faculty to set the requirements f
admission to the School, to provide courses and programs of study a
research for its students, to establish academic standards for its degree
to recommend to the Board of Trustees the awarding of degrees, to l
down regulations as needed for the operation of the School, and general
to supervise its activities.

The administration of the School is vested in the dean, who is chairma
of the Dean's Council, which is responsible to the Faculty of the Scho
for all policy matters.

ADMISSION REQUIREMENTS

Application forms for admission to graduate study are obtained from th
Office of the Dean of the Graduate School of Arts and Sciences. Whe
completed, these application forms must be submitted to this office, to

ether with college transcripts and letters of reference, and other informa-ion as required by the department or program. Admission is dependent on lepartmental recommendation and approval by the dean.

Applicants must have academic backgrounds of excellence, usually with najors, or equivalent, in the fields in which they intend to study for ad-anced degrees. Normally, a *B* average (or equivalent) from an accredited ollege is required. With evidence of special promise, such as high Gradu-te Record Examination scores, an applicant may be accepted whose cademic record falls short of *B*. The minimum does not assure automatic cceptance. The departments may, and often do, set higher admission tandards. Moreover, the number of spaces available for new graduate tudents limits the number that can be accepted. Students who apply in heir senior year must have completed their baccalaureate work before egistration in the Graduate School and must present evidence of such ompletion. The Graduate School requires the Graduate Record Examina-tion (aptitude test only) for all Ph.D. applicants except foreign nationals. Some departments require the aptitude test for applicants for the master's degree, and some require a Graduate Record Examination advanced test for all applicants. Students whose native language is not English are re-quired to take the *Test of English as a Foreign Language* (TOEFL), ad-ministered by the Educational Testing Service, Princeton, N.J. (see page 26). International applicants already in Washington may take the Uni-versity's English Placement Test in lieu of the TOEFL.

Application for Admission—Applicants who are requesting fellowship support must submit completed applications by February 15 (February 1 for students in clinical psychology and art therapy) for admission in the fall semester and by November 1 for admission in the spring semester. Completed applications for graduate study without fellowship support must be received by July 1 for the fall semester, by December 1 for the spring semester, and by April 15 for the summer sessions, unless otherwise noted.

Readmission—A student who wishes to resume a graduate program which had been interrupted, must file an application form to be considered for readmission. Readmission is not guaranteed, and the application is subject to review by the department concerned and the dean. The student may be required to take qualifying examinations on the course work completed. Application forms are available in the Graduate School Office.

REGULATIONS

Regulations regarding admission, registration, fees, and finances are stated on pages 20-32; other University regulations, on pages 44-52.

In addition, the Graduate School publishes a Student Handbook each academic year which contains updated information on the School's policies, regulations, and other matters of concern to enrolled or admitted students. It is the responsibility of the student to be aware of the informa-tion contained in this *Bulletin* and the Handbook.

Grades

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; Z, Fail; Unauthorized Withdrawal; *CR*, Credit.

The symbol *I* (Incomplete) indicates that a satisfactory explanation been given to the instructor for the student's failure to complete the quired work for a course. The "Incomplete" must be made up before lapse of one calendar year. An "Incomplete" for regular course work wh is not removed within one calendar year remains permanently as a gr of *I* on the student's record. The grade of *I* cannot be removed by rere tering for the course here, or by taking its equivalent elsewhere.

The grade of *I* is also given for all thesis and dissertation resea courses until the thesis or dissertation is completed. Upon the satisfact completion of the thesis or dissertation the grade *I* is changed to automatically. The grade of *CR* is given for an *Advanced Reading Research* (usually numbered 398) course.

Scholarship Requirements

Graduate students are required to maintain a minimum accumulative gr average of *B* (3.00) in all course work taken following admission to Graduate School. Individual departments may require a higher avera The fields of art history and English require a 3.25 average. If the requi grade average is at any time not maintained, the student's degree candida is subject to termination.

In the case of a student who receives a grade of *F* for a course in program of studies, the Graduate School will require a written statem from the department justifying the student's continuance in the Gradu School and outlining the program to be followed. Continuation is contingo upon the dean's approval. When a grade of *F* is received for a course the program of studies, the grade is included in the student's grade po average whether or not the course is repeated.

A student may repeat for credit a course in which a grade of *C* or abo was received only when permitted to do so by the department concern unless the course description states that the course may be repeated credit. A written statement to this effect must be submitted for approval the dean's office by the appropriate departmental advisor. It is then fil with the Registrar. If a course is repeated for credit, the first grade r ceived remains on the student's record and is included in the studen grade point average.

A graduate student may take an advanced undergraduate course (cours numbered 101-199) for graduate credit only upon the approval of the de and the department at the time of registration. Such approval is grant only with the provision that the student complete additional work in ord to receive graduate credit.

Program of Studies

The program of studies must be approved by the dean and the depar mental advisor and filed in the Graduate School Office no later th November 1 for graduate students entering in the fall semester, or Mar

5 for graduate students entering in the spring semester. A program of udies may be revised, when necessary, by obtaining the approval of the epartmental advisor and the dean. The revision must be filed in the raduate School Office. A completed course cannot be dropped from ie program of studies unless it is due to an error in advising or an dministrative error. Such a change in the program requires the approval of ie dean.

Probationary Students—It is especially important for those admitted s probationary students to consult with their departmental advisor as arly as possible regarding completion of special requirements, which iust be entered on the Probationary Students Requirements Form that ikes the place of the Program of Studies. The exact conditions for ad- iission of probationary students must be satisfied.

ontinuous Enrollment

ll students must be continuously enrolled while working toward a egree, except during the summer sessions. If continuous enrollment is ot maintained, the student is dropped from the degree program unless leave of absence is granted by the Graduate School.

Master's candidates should meet the calendar deadline for completing he degree as specified in the program of studies. If the deadline is not iet, assuming academic approval for an extension which may be granted n exceptional circumstances, the student must register and pay for six redit hours of "Reading and Research" each semester.

Doctoral students in the first unit of their programs shall meet the alendar deadline for completing this unit as specified in the program f studies. Completion of the first unit includes satisfactory completion f course work, tool requirements, and the General Examination. If he deadline is not met, assuming academic approval for an extension vhich may be granted in exceptional circumstances, the student must egister and pay for six semester hours of "Reading and Research" each emester. These hours will not be credited toward completion of the legree. Doctoral students in the second unit of their programs, i.e., disser- ation research, should complete this unit as specified in the program of tudies. If the deadline is not met, assuming academic approval for an xtension which may be granted in exceptional circumstances, the student nust register and pay for six semester hours of "Reading and Research" ach semester.

eave of Absence

A student who is temporarily unable to continue the program of studies nay request leave of absence for a specific period of time, not to exceed ne calendar year during the total period of degree candidacy. When he period of leave has expired, it is the student's responsibility to iotify the Graduate School at least two months in advance of a given egistration period of intention to reregister. If a student fails to re-register, he candidacy is terminated.

Withdrawal

Graduate students who intend to withdraw from the Graduate Scho should inform the School in writing. The last day for *complete* withdraw without academic penalty is at the end of the eighth week of classes.

Graduation Requirements

All students must file an Application for Graduation and pay the r quired graduation fee at the time of registration for the last semester summer session of the final year in which they intend to graduate. Studen must be registered in the Graduate School during the semester they plan graduate. Master's and doctoral candidates may graduate in May, Februar or September. Students who have completed the requirements for a degre but have not yet been awarded the degree will be issued a letter to th effect upon request.

DEGREES

Listed below are the degree programs of the Graduate School of Arts an Sciences and the specific degrees offered, by field. The programs are d rected by the departments concerned. Degree programs which bridge tw or more departments are directed by committees composed of membe of the departments concerned. For further information write to the dea or the chairman of the appropriate department.

The degrees of Master of Arts in Special Studies and Master of Scienc in Special Studies are designed for students who do not wish to concen trate in a specific discipline. The Graduate School of Arts and Science offers programs on campus leading to the degree of Master of Arts i Special Studies with concentration in Crime in Commerce, Criminal Justic Environmental Policy, Gerontology, Women's Studies, and Philosophy an Social Policy.

Students with special academic goals may pursue individualized pro grams of study toward the M.A. or M.S. in Special Studies subject t approval by the Committee on Individual Programs and the dean. Course must be drawn from a minimum of three fields, with a maximum o 18 hours from any one field. A majority of courses must be taken withi the Graduate School of Arts and Sciences. Also required is a one-semeste colloquium on interdisciplinary methods. The nature of the comprehensiv examination is a final essay in which the integration of the program o study is demonstrated. The School also offers Master of Arts in Specia Studies and Master of Science in Special Studies degrees in specifi academic areas at off-campus locations (see page 103).

Graduate Fields

The graduate course work offered in support of the degree programs in the following list is shown by department in this catalogue.

I. Humanities	Degrees Offered
American Civilization	M.A. Ph.D.
American Literature	M.A. Ph.D.

Art:	M.F.A.	
Ceramics		
Design		
Graphics		
Painting		
Photography		
Sculpture		
Visual Communication		
Art History	M.A.	Ph.D.
Dramatic Art	M.F.A.	
English Literature	M.A.	Ph.D.
*French Literature	M.A.	Ph.D.
History of Religions—Hinduism	M.A.	
Museum Studies	M.A.	
Music:	Mus.M.	
Applied Music		
Composition		
Conducting		
Music Theory		
Musicology	M.A.	
Religion	M.A.	
Religion and Medical Care	M.A.	
Religious Education	M.A.	
Russian Language and Literature	M.A.	
*Spanish-American Literature	M.A.	Ph.D.
*Spanish Literature	M.A.	Ph.D.

II. Social Sciences

Anthropology	M.A.	
Economics	M.A.	Ph.D.
Education Policy		Ph.D.
Geography	M.A.	
History	M.A.	Ph.D.
Political Science	M.A.	Ph.D.
Sociology	M.A.	Ph.D.

III. Physical and Mathematical Sciences

Applied Mathematics	M.A., M.S.	
Applied Statistics	M.S.	
Chemical Toxicology	M.S.	
Chemistry	M.S.	Ph.D.
Engineering Geology	M.S.	
Forensic Sciences	M.F.S., M.S.F.S.	
Geobiology	M.S.	Ph.D.
Geochemistry	M.S.	Ph.D.
Geology	M.S.	Ph.D.
Mathematical Statistics	M.A.	Ph.D.
Mathematics	M.S. for Teachers, M.A.	Ph.D.
Physics	M.A.	Ph.D.

* Any approved combination of French, Spanish, or Spanish-American Literature is available as a Doctor of Philosophy field.

IV. Biomedical and Related Sciences

Anatomy		Ph
Art Therapy	M.A.	
Biochemistry	M.S.	Ph
*Biological Sciences	M.S.	Ph
Genetics	M.S.	Ph
Microbiology	M.S.	Ph
Pathology		Ph
Pharmacology	M.S.	Ph
Physiology	M.S.	Ph
Psychology	M.A.	Ph
Radiological Sciences		Ph
Speech-Language Pathology and Audiology	M.A.	

Combined Master of Science and Doctor of Medicine Degrees

Students interested in the combined degrees of Master of Science a Doctor of Medicine must meet the requirements for admission to t Graduate School of Arts and Sciences and to the Doctor of Medicine d gree program of the School of Medicine and Health Sciences.

The Master of Science program consists of a minimum of 30 semest hours of credit and the fulfilling of the tool requirement (see page 9 A maximum of 12 semester hours of credit for graduate-level courses co *pleted as a part of the Doctor of Medicine degree curriculum* (and n already applied toward the bachelor's degree) will be allowed in fulfi ment of the requirements of the Master of Science degree. The remaini 18 semester hours of work, which in most programs incudes a thesis, mu be work in the basic medical sciences normally required for a Master Science degree in the Graduate School of Arts and Sciences.

Joint Master's–Juris Doctor Program

Students interested in working concurrently toward the Juris Doctor d gree in the National Law Center and a master's degree in the Gradua School of Arts and Sciences must meet the requirements for admission both schools and all requirements in each degree program. It is possib for a student to complete work for both degree programs within four yea

Dual Program for Doctor of Medicine and Doctor of Philosophy Degrees

A dual program is available to qualified students who seek both the Doct of Medicine and Doctor of Philosophy degrees. The requirements whic must be fulfilled for both degrees are identical to those currently an separately established in the School of Medicine and Health Sciences an the Graduate School of Arts and Sciences.

A student working toward these degrees may apply a maximum of 2 semester hours of approved course work in the School of Medicine an Health Sciences toward the minimum of 48 hours of course work require to qualify for the General or Cumulative Examination for doctoral candi dacy. This course work is normally taken during the semesters that alter nate with the medical program and in the years following the award o the M.D. degree. The student's research for the dissertation may begi

* Biology, botany, and zoology.

concurrently with the final 24 semester hours of graduate course work leading to the General or Cumulative Examination. The estimated time for the completion of this dual program is six years.

In order to enter the dual degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. Upon admission to both schools, the student may then apply for affiliation with the dual degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a departmental doctoral committee.

REQUIREMENTS FOR THE DEGREES

The Master's Programs

Unless otherwise specified, the requirements listed below are applicable to candidates for the degrees of Master of Arts, Master of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science for Teachers, Master of Science in Forensic Science, and Master of Science in Special Studies.

1. *General Requirements*—For a master's degree program *including* a thesis, the satisfactory completion of a minimum of 30 semester hours of approved graduate work, including six semester hours of thesis research, is required. For a master's degree program which does *not* include a thesis, the number of semester hours of approved graduate course work is determined by the department, and normally consists of from 30 to 36 semester hours. The program without the thesis is not an individual student option and is not available in every department. Departments can and often do set requirements above the minimum required by the Graduate School. The program of study leading to the degree of Master of Arts in Special Studies or Master of Science in Special Studies consists of 36 semester hours of approved graduate course work and does not require a thesis.

Work taken to make up deficiencies is never counted as part of the requirements leading to a master's degree. Upon approval, up to one-half of the required graduate work may be taken in courses offered by the other affiliated institutions of the Consortium of Universities of the Washington Metropolitan Area, Inc., or by another degree-granting division of this University. If credit is transferred from another institution (see "Transfer of Credit," below), the number of semester hours which may be taken at an affiliated Consortium institution is reduced by the number of hours accepted as transfer credit.

All master's degree candidates must complete degree requirements within four years. Extensions beyond this time period require approval of a written request based on specific and temporary interfering circumstances.

2. *Academic Work Load*—Full-time students register for nine to 12 semester hours each semester; part-time students must register for six semester hours each semester. These requirements do not apply to students who have fewer than nine semester hours (full-time) or six semester hours (part-time) remaining to complete their programs. No more than 15 semester hours may be taken during any one semester.

3. *Transfer of Credit*—A maximum of one-quarter of the semester hou of graduate course work required for a degree may be approved for tra fer to the Graduate School from the Division of University Students, a other degree-granting division of this University, or another accredit college or university. For a transfer of credit to be approved *all* of t following conditions must be met: the course work must have been tak prior to admission to the Graduate School, it must be approved as part the student's program of studies, it must not have been applied to t completion of requirements for another degree, it must be post-baccala reate graduate-level course work, it must have been taken within the pa two years, and the student must have received a grade of *B* or better each course for which a transfer of credit is requested. This action mu be made in writing and approved by the departmental advisor and th dean. A transcript of the course work must be on file before the reque can be considered.

4. *Tool Requirement*—Candidates for the degrees of Master of Arts the field of art therapy, Master of Arts in Special Studies, Master of Ar in the field of speech pathology and audiology (nonthesis option), Mast of Forensic Sciences, Master of Music, Master of Science in the field Chemical Toxicology, and Master of Science in Special Studies; candidat for master's degrees in the Department of Mathematics; and candidates f the degree of Master of Fine Arts in the field of dramatic art need not fu fill a tool requirement. Master's candidates normally must successfull complete a tool requirement in a foreign language, mathematics, statistic or computer programming, or by graduate course work outside the majo department (see option [c] below). In place of a tool requirement, cand dates for the degree of Master of Fine Arts in the fields of ceramics, de sign, graphics, painting, photography, or sculpture will complete a method course selected by the Department of Art.

The tool requirement examination should be passed prior to the begin ning of the third semester of graduate work; students who have not fu filled this requirement must register for the appropriate course at th beginning of the third semester. Students who elect graduate course wor outside the major department in order to fulfill the tool requirement mus complete this course work before taking the comprehensive examinatio or undertaking thesis work. Courses taken to satisfy the tool requir ment usually cannot be counted in the semester-hour requirement for th master's degree. No master's candidate may attempt a tool examinatio more than three times. A tool requirement fulfilled at another universit cannot be used to fulfill the requirement at this University.

With the approval of the department directing the student's progra of study, the tool requirement may be selected from the following option

(a) Passing a foreign language reading examination (a student ma register for the appropriate reading course for nonmajors or make arrange ments with the appropriate department to take the examination on th scheduled dates). A student majoring in a foreign language may not selec that language to satisfy this requirement. English may not be elected as tool requirement.

(b) Completing a course in mathematics, statistics, or computer program ming which is approved by the appropriate department and by the Gradu ate School; or passing a special examination covering the approved cours

material, administered by the appropriate department, at the level of the final examination.

(c) Completing with a grade of *B* or better a minimum of six semester hours of graduate course work in a department other than the student's major department. Three semester hours of this course work will not be counted toward the minimum semester-hour requirement of the student's degree program.

5. *The Thesis*—The main purpose of a master's thesis is to demonstrate the student's ability to make independent use of information and training, and to furnish objective evidence of constructive powers in a chosen field. The student registers for six semester hours of thesis research and must complete the thesis no later than four calendar years after the initial registration. Registration for thesis research entitles the student to the advice and direction of the member of the faculty under whom the thesis is to be written. The thesis subject must be approved by the faculty member who will be directing the thesis. The thesis, in its final form with one copy and a certificate of approval signed by the thesis director and by at least one departmental reader, must be presented to the dean no later than the date announced in the University Calendar. All theses must meet the form, style, and other requirements set forth in a pamphlet, *Information Concerning Theses and Dissertations*, available in the Office of the Dean.

6. *Master's Comprehensive Examination*—Most master's degree candidates must pass a Master's Comprehensive Examination in the major subject. Examinations are held on dates fixed by the departments, so that results can be filed in the Graduate School Office no later than the day before the faculty meets to approve the list of graduates. The nature and form of the examination is the responsibility of the department or program.

A student who fails to pass the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

The Doctor of Philosophy Program

The minimum requirements for the doctoral program are as follows:

1. *General Requirements*—The program leading to the degree of Doctor of Philosophy requires the satisfactory completion of a minimum of 72 semester hours of approved graduate work for entering students whose highest earned degree is a baccalaureate. A minimum of 48 of these hours must be taken in preparation for the General Examination. Entering students whose highest earned degree is a master's degree are required to register for a minimum of 48 semester hours of approved graduate work, no fewer than 24 of which must be taken in preparation for the General Examination. While completing the dissertation portion of the program, the student must register for 12 to 24 semester hours of dissertation research, depending on the number of hours completed prior to the General Examination. The exact number of semester hours required for any part of the total program is assigned by each department and may exceed the minimum required by the Graduate School.

2. *Academic Work Load*—Full-time students register for nine to semester hours each semester; part-time students must register for semester hours each semester. These requirements do not apply to s dents who have fewer than nine semester hours (full-time) or six semes hours (part-time) remaining to complete their programs.

3. *Transfer of Credit*—Entering students who do not hold a master's gree may request transfer of up to 24 semester hours of credit toward doctoral degree for acceptable post-baccalaureate graduate work taken the master's degree level at George Washington University or another credited college or university.

4. *Tool Requirements*—As early as possible, and *before* completion the General Examination, the tool requirements specified in the progra of study must be completed. Various options are available for fulfilling t tool requirements: each department may permit certain options and n others, and all individual choices of tool options must have the approval the student's department and of the Graduate School. Options for fulfilli tool requirements are as follows:

(a) Two foreign language reading examinations. English may not elected as a tool requirement.

(b) High-level proficiency in one foreign language.

(c) Substitution for one foreign language reading examination of examination, conducted by the appropriate department, in mathematic statistics, or computer science. An examination in a graduate course at th University may satisfy this requirement.

(d) Substitution of certain graduate course work as follows: a minimu of six semester hours, completed with grades of *B* or better, in a depa ment other than the student's major department, in place of one forei language reading examination. Certain departments may permit optio (c) and (d) in place of both foreign language reading examinations; certa departments, as well, may permit 12 hours of graduate course work in a other department to satisfy the tool requirement.

Students permitted to elect options (a) or (c) above who enter the Gra uate School with a bachelor's degree must satisfy the first tool requireme before completion of 15 semester hours of course work; students enteri with a master's degree must satisfy the first tool requirement no lat than the second semester of registration as a candidate for the Doct of Philosophy degree. Courses taken to fulfill the tool requirement und options (a), (b), and (c), and three of the semester hours' credit earn under option (d) (six if option [d] is permitted in place of both forei language reading examinations) will not be counted toward the minimu semester hour requirement for the degree.

Further information regarding the various tool requirements is stat in the Graduate School's *Student Handbook*.

5. *The General Examination*—Each student is required to complete t General Examination no later than the semester following the completi of course requirements. The General Examination is composed of written examination five to six hours in length in each of the areas of stu comprising the student's total program; the time permitted between ea examination is determined by the administering department. Some d partments permit one or two areas of study to be "written off"; that is, special, shorter examination is given after a year of course work in t

area. A cumulative examination system is in effect in the fields of chemistry and physiology, and in the field of psychology a system of two comprehensive examinations is used. Students in these fields should consult the appropriate department for information about its system.

A student who fails to pass any part of the General Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

Satisfactory performance on the General Examination is required for admission to the second stage of candidacy for the Doctor of Philosophy degree, consisting of the dissertation and final examination. Admittance to the second stage of candidacy is permitted only if the student's General Examination committee finds that the student's performance on the examination and in course work gives a good indication of success in the second stage. Passing of comprehensive examinations at the minimum level does not necessarily give this indication.

6. *The Degree of Master of Philosophy*—Upon departmental recommendation and approval of the dean, the degree of Master of Philosophy may be awarded to students who have successfully completed all requirements for the Doctor of Philosophy degree up to and including the General Examination. Not all departments recommend students for this degree.

7. *The Dissertation and Final Examination*—A dissertation is required of each doctoral candidate as evidence of ability to perform scholarly research and interpret its results. The candidate normally enrolls for *Dissertation Research* upon completion of the General Examination; however, the candidate may register for up to six semester hours of *Dissertation Research* during the time the General Examination is being completed. If the dissertation is not completed within five years from the date the General Examination is completed, the student will be required to retake the General Examination.

No later than the date specified in the University Calendar, the candidate must submit to the dean the original and one copy of the dissertation and an abstract for inclusion in the Announcement of the Final Examination and for reproduction by University Microfilms, Inc.

When the dissertation has been approved by the director, two members of the Doctoral Program Committee, and the dean, the candidate takes the Final Examination, an oral examination which is open to the public. A committee of examiners (composed of Graduate School faculty and, when appropriate, outside scholars) conducts the examination. A sufficient number of copies of the dissertation must be provided by the candidate for the members of the Examination Committee. If the candidate passes, he or she is recommended by the Graduate School for the degree of Doctor of Philosophy.

Detailed information regarding regulations for the form and reproduction of the dissertation is available in the Office of the Dean. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover the expense of printing the Announcement of the Final Examination, and for the basic service rendered by University Microfilms, Inc.

FELLOWSHIPS AND FINANCIAL AID

A limited number of graduate teaching assistantships and Univers Fellowships are available in most departments of instruction to stude registered in the Graduate School of Arts and Sciences. A limited num of other kinds of sponsored and University awards are also available.

Students applying for admission who also wish to apply for a fello ship should submit the fellowship application and the application admission by February 15; the necessary transcripts, Graduate Reco Examination scores, and letters of recommendation should also be on by this date. Students currently enrolled in the Graduate School shou submit only the fellowship application and have current letters of reco mendation on file by February 15.

Forms are available at the Office of the Graduate School of Arts a Sciences. Filing the fellowship application entitles the student to co sideration for all awards available in the student's department.

Students who wish to apply for loans should indicate their intent to so on the application for admission. Information concerning loans is co tained in a booklet, *Student Financial Aid*, available from the University Student Financial Aid Office.

COOPERATIVE PROGRAMS

The American Studies Program at George Washington University affiliated with the American Studies Program of the Smithsonian Institu tion. This arrangement offers students in the field of American civiliz tion an opportunity to take advantage of the Washington environmen Members of the staffs of the Smithsonian's American Studies Progra Museum of History and Technology, National Portrait Gallery, and N tional Collection of Fine Arts offer seminars and tutorial instruction fields which provide students with an unusual opportunity to develop ne dimensions in the discipline of American civilization. This program study is open to students working toward the degrees of Master of Ar and Doctor of Philosophy, and is intended to prepare them for researc teaching, and museum-related careers.

The Art Department of George Washington University and the Smith sonian Institution offer a joint graduate program of study and research museum studies leading to the degree of Master of Arts in the field Art History with a concentration in Museum Training. The Departme has also established a program of study in affiliation with the Corcor Gallery of Art, the Freer Gallery, the Hirshhorn Museum and Sculptur Garden, the Museum of African Art, the National Collection of Fine Art the Phillips Collection, the Renwick Gallery, and the Textile Museum.

A program of study leading to the degree of Doctor of Philosophy American Civilization with emphasis on library research and collections offered jointly by George Washington University and the Library of Co gress. The coordinator of the Library Program and the staff offer an orien tation seminar and other courses and supervise students in reading an research and in work on such library problems as indexing, cataloguin and bibliography.

For further information concerning these programs contact one of th following offices at George Washington University: the Graduate Schoo

of Arts and Sciences for those who are interested in any of the fields listed above, the Art Department for those interested in art museum training, the American Studies Program for those interested in the field of American civilization.

George Washington University, in cooperation with two other universities and the Folger Shakespeare Library, helped establish the Folger Institute for Renaissance and 18th-century Studies as a cooperative venture in graduate studies in the humanities. Fifteen universities are now member institutions. Seminars (limited to 12 students each) are offered each semester under the direction of American and foreign scholars. The Folger Library forms the core of the Institute. All participants enrolled in the seminars are granted access to the collections of rare books, manuscripts, and reference materials of the Library. There are also opportunities for participants to form contacts with the Fellows and readers at the Library, in the process of their research. All registered students are eligible to apply for admission to one or more of the seminars, although priority in enrollment will be accorded graduate students working on dissertations and postdoctoral scholars from the sponsoring institutions.

Further information, including a listing of seminar topics, is available in the Office of the Graduate School of Arts and Sciences or at the Folger Shakespeare Library.

The University and the National Bureau of Standards have entered into a cooperative agreement to further educational opportunity at both the University and the Bureau. This arrangement holds promise for graduate study and research, with emphasis in the physical sciences.

SPECIAL OFF-CAMPUS DEGREE PROGRAMS

The Graduate School of Arts and Sciences is currently offering the following special degree programs off campus: (1) the degree of Master of Arts in Special Studies with areas of concentration in Criminal Justice, Energy Policy, Legislative Affairs, Social and Organizational Behavior, and Urban Learning; (2) the degree of Master of Forensic Science; and (3) the degree of Master of Science in Special Studies with areas of concentration in Employment Policy, Environmental Science, Oral Biology, Regulatory Policy, Social and Economic Statistics, and Telecommunications Policy. Not all of these programs may be available in any given year. For details consult the Graduate School of Arts and Sciences.

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Dean E.W. Kelly, Jr.
Assistant Dean R.E. Baker
Executive Assistant to the Dean L.H. Kornhauser

FACULTY*

Professors R.E. Baker, J.G. Boswell, J.L. Breen, M. Brenner, F.J. Brov
R.S. Cottrell, Jr., L.H. Elliott, R. Ferrante, D. Hawkins, G.L. Horrwor
R.K. Ives, S. Kavruck, E.W. Kelly, Jr., E.P. Kulawiec, D. Linkowski,
Marinaccio, M. McIntyre, D.A. Moore, L. Nadler, S.R. Paratore, D
Paup, M.N. Rashid, J.R. Shotel, J.E. Snodgrass, L.M. Stallings, R. Tillm
C.E. Vontress, L. Winkler

Associate Professors M. Burns, M.S. Castleberry, A.L. Dickerson *(R*
search), J.D. Fife, L.H. George, J.A. Greenberg, J.C. Heddesheimer, N
Johnson, A.P. Kowalski *(Research)*, R.I. Peterson, G.W. Smith, N.J
Sobel, L.A. Tsantis, G.D. Wiggs, M.R. Withers, S.A. Wyman

Assistant Professors J.R. Blank *(Research)*, A.E. Hunter *(Research)*, R
Ianacone, E.R. Lilly, R.A. Luke, R.K. Lynch, A.J. Mazur, H. Nashm
J.R. Snider *(Visiting)*, N. Tiscione

Research Instructors M.B. Freund, A.H. Macomber, A.H. Morris, C.B. Sta

Members of the Advanced Graduate Faculty

R.E. Baker, J.R. Blank, J.G. Boswell, J.L. Breen, M. Brenner, F.J. Brov
M. Burns, M.S. Castleberry, R.S. Cottrell, Jr., A.L. Dickerson, L.H. Ellio
R. Ferrante, J.A. Greenberg, D. Hawkins, J.C. Heddesheimer, G. Horrwor
R.N. Ianacone, R.K. Ives, S. Kavruck, E.W. Kelly, Jr., E.P. Kulawiec,
Linkowski, R.A. Luke, A. Marinaccio, A.L. Mazur, D.A. Moore, L. Nadl
S.R. Paratore, D.C. Paup, R.I. Peterson, M.N. Rashid, J.R. Shotel, G.
Smith, J.E. Snodgrass, N.J.S. Sobel, L.M. Stallings, R. Tillman, N
Tiscione, L.A. Tsantis, C.E. Vontress, G.D. Wiggs, L. Winkler

Committees†

EXECUTIVE COMMITTEE

R.S. Cottrell, J.C. Heddesheimer, D. Linkowski, L. Nadler, M.N. Rash
J.E. Snodgrass

CURRICULUM COMMITTEE

J.G. Boswell, D. Hawkins, R.K. Ives, R.A. Luke, M.K. Rashid, L.M. Stallin

* The President of the University, the Vice President for Academic Affairs, the Registrar of University, the Director of Admissions of the University, and the University Librarian are *officio* members of the Faculty of the School of Education and Human Development.
† The dean and the assistant dean of the School of Education and Human Development *ex officio* members of all committees.

CULTY COMMITTEE

. Greenberg, E.P. Kulawiec, L. Nadler, J.R. Shotel, L.M. Stallings, L. Winkler

HOOL, COMMUNITY, AND ALUMNI AFFAIRS COMMITTEE

H. George, A.J. Mazur, L. Winkler, M.R. Withers

UDENT COMMITTEE

L. Horrworth, N.D. Johnson, H. Nashman, L.A. Tsantis

TRODUCTION

e University began offering professional courses for teachers in 1904-05, d in 1907 it established a Division of Education. In 1909 the Division of ucation became the Teachers College which in its early years was con- rned largely with teacher preparation on the undergraduate level.

In 1928 the Teachers College became the School of Education and greater ovision was made for advanced study. Since that time the graduate en- llment has steadily increased, with the result that today the School has a nsiderably larger number of graduate than undergraduate students. To flect the current scope of its offerings, the name of the School was anged in 1977 to the School of Education and Human Development.

The School of Education and Human Development prepares teachers, source and support personnel, and administrators for educational service. e School also offers opportunities to experienced teachers to extend d enrich their education. The programs are designed to meet the broad eds of all persons who seek the knowledge and skills necessary to pro- de for effective learning and teaching. The School's programs focus on e needs of persons interested in the traditional elementary and second- y school environments, but also include the preparation of individuals r all areas of education covering the life span from pre-school through e adult years in both the public and private sectors of society. The llowing undergraduate programs are representative: human services, nce therapy, and dance as a performing art. The following Master's gree programs are representative: adult education, college student de- lopment, dance, early childhood education and early childhood special ucation, generic counseling, gifted and talented, higher education, hu- an resource development, individualized Master's, liaison special educa- r/parent educator, perceptual motor development, rehabilitation counsel- g, therapeutic recreation, tourism development and travel administration, cational/special education.

A Bachelor of Arts in Education and Human Development is more than eparation for teaching in schools. The degree provides background and periences for careers in a variety of public and private settings. A ajority of the credit hours of required courses are in the liberal arts. In dition, the programs provide opportunities for students to develop itical thinking and reasoning, as well as leadership, organizational, and anning skills. Emphasis is placed upon developing the human relation-

ship qualities that are essential in fields that require involvement
people in all age ranges and from all walks of life.

The School of Education and Human Development is the administr
unit for three departments; Education, Human Kinetics and Le
Studies, and Special Education. In addition to programs of study lea
to its degrees, the School offers credit and non-credit workshops desi
specifically to meet the unique needs of metropolitan area school syst
and other clienteles in private industry and in government.

Special curricula are tailored on an individual basis for liberal
graduates and graduates of other professional schools who are intere
in teaching or in other human services areas. The School also offers a
range of courses for teachers who wish to renew licenses and for
visional teachers who wish to prepare for teaching certificates.

Laboratory and clinical facilities are provided by the University Rea
Center. Field experiences are provided in cooperation with public
private schools, social agencies, museums, institutions in the busi
community, and community and junior colleges.

The schedule of courses is arranged to meet the convenience of
full-time and part-time students.

Professional Courses for Non-Education Majors

Columbian College students in a number of major fields are permitte
use their electives to complete up to 18 credit hours of professional ed
tion courses required for teaching in middle schools and junior and se
high schools. Students may graduate with 120 semester hours or
choose to complete all courses required for teacher certification and gra
ate with a program in excess of 120 semester hours. Students interes
in taking these courses should contact the office of the dean of the Sch
of Education and Human Development.

Freshmen and sophomore students may take professional educa
courses that include field work experiences. Some of these courses m
it possible for students who are undecided about their choice of a ca
to have an opportunity to test teaching and some of the many rel
helping services areas.

A number of professional education courses are open to non-educa
majors. It is recommended that students check with one of the three ed
tion departments for more specific information on courses that are o

Education for Teaching

Programs of study in education for teaching are based upon the assu
tion that every teacher should have a broad general education, mas
of the content of instruction, and professional competencies.

The relative emphasis placed upon each of these aspects of the t
education for teaching varies in accordance with the purposes of e
program. For instance, since elementary school teachers teach all subje
they require content preparation of greater breadth and less specializa
than secondary school teachers.

It is the view of the School of Education and Human Development
an acceptable minimum education for teaching requires four years of

he study or the equivalent in part-time study. For superior preparation achers are urged to plan for five years of full-time study or the equivaht in part-time study.

The student may choose any one of the following plans to achieve perior educational preparation for teaching or for other educationlated fields:

1. Upon receiving the bachelor's degree in education, he or she may take a teaching position and, after acquiring some professional experience, return to the School for graduate study leading to the master's degree. This plan enables students with bachelor's degrees to begin their teaching careers, and to use their work experience to enhance graduate study which will follow.

2. The student may choose to pursue full- or part-time graduate study leading to the master's degree immediately after receiving the bachelor's degree.

3. A student whose bachelor's degree is in one of the liberal arts disciplines may choose to complete the requirements for certification for teaching by studying in one of the teaching fields in a program custom-tailored to his or her particular needs.

EGULATIONS

iiversity regulations concerning admission, registration, fees, and ances are stated on pages 20-32; other University regulations, on pages -52.

neral Scholarship Requirements For Undergraduates

gulations regarding academic standing, probation, suspension, withawals, classification of students, required placement examinations and iiving introductory courses by examination are the same as those for lumbian College; they appear on pages 70-71 and 75-77 of this *Bulletin*.

ADEMIC WORK LOAD

teen to 17 semester hours of credit constitute a normal program. A dent with a quality-point index of 3.00 or higher may, with the persion of the dean, enroll for 18 or 19 hours. No student may enroll for re than 19, except by permission of the Committee on Scholarship.

The following work load regulations apply to both graduate and undeduate students.

Students employed 15 hours or less a week may carry a normal pron of college work.

Students employed from 16 to 25 hours a week may enroll for 12 or hours. Those with a quality-point index of 3.00 or higher may, with cial permission of the dean, enroll for 15 or 16 hours.

Students employed from 26 to 34 hours a week may enroll for 9 or 10

hours. Those with a quality-point index of 3.00 or higher may, special permission of the dean,* enroll for 12 or 13 hours.

Students employed 35 hours or more a week may enroll for 6 hours. Those with a quality-point index of 3.00 or higher may, special permission of the dean,* enroll for 9 or 10 hours.

Students who increase their hours of employment after registratio at any time during a semester must report immediately to the dea that their programs may be adjusted, if necessary.

Graduate students employed full-time may take a maximum of 6 mester hours, unless special permission to take more is granted by dean.*

REQUIRED PLACEMENT EXAMINATIONS

English—Students whose College Board English Composition Achie ment Test scores suggest that they will benefit from more intens training in compositional skills may be assigned to English 9 or may tested in vocabulary, spelling, grammar, standard usage, and writing s before placement in either Engl 9 or 10.

Foreign Languages—A student who has not been granted advan standing and who wishes to continue in college the language begun high school must take a placement examination in one of the follow Chinese, French, German, Greek, Hebrew, Italian, Latin, Russian, Spanish. Upon completion of the examination, assignment is made to appropriate course.

Mathematics—New students accepted for registration in Math 30 required, prior to registration, to take a placement examination in alge and trigonometry; those accepted for registration in Math 51 are quired, prior to registration, to take a placement examination in algeb (See specific mathematics requirements listed under elementary or sec dary education majors.)

EARNING CREDIT BY EXAMINATION

Undergraduate students may earn semester-hour credits up to a maxim of 30 hours by performing satisfactorily on College-Level Examinat Program (CLEP) Tests or special departmental examinations provided the departments of Columbian College of Arts and Sciences on an in vidual basis. Passing a waiver examination does not entitle the student any semester hours of credit in the School of Education and Human velopment. A limited amount of credit may be assigned for selected serv school instruction received since 1941.

Students interested in becoming certified to teach who have ear bachelor's or graduate degrees in fields other than education may sati some certification requirements by taking the CLEP Examinations or s cial departmental examinations. See pages 22-23 for general informat on the CLEP tests, and for information on special examinations offered departments.

* Request forms are available at the office of the dean. They should be filled out and retur to the office of the dean at least two weeks prior to registration.

HE BACHELOR'S DEGREES

he School of Education and Human Development offers undergraduate rograms leading to the degrees of Bachelor of Arts in Education and uman Development (elementary, middle school, secondary education; lementary education/early childhood education; elementary education/ pecial education: complementary teacher program; and human services) nd Bachelor of Science in Human Kinetics and Leisure Studies (ele- nentary/secondary physical education, dance education, dance therapy, nd dance as a performing art).

achelor of Arts in Education and Human Development

he programs leading to the degree of Bachelor of Arts in Education and uman Development (elementary, middle school, and secondary education, lementary education/early childhood education, and elementary educa- ion/special education: complementary teacher program) are planned o provide (1) general educational backgrounds, (2) functional command f concepts and skills in one or more teaching fields, (3) mastery of basic rofessional information and skills adequate for the beginning teacher, and 4) development of attitudes needed for success in teaching or in other elated human services fields.

The general educational backgrounds needed by prospective teachers r by persons interested in being employed in other human services fields re obtained through college courses, work experience, leadership activi- ies, and off-campus cultural opportunities.

As part of formal course work, and on their own initiative, students of he School of Education and Human Development are expected to take full dvantage of the many opportunities in the Washington area for develop- ng leadership skills. Advisors are available to help students plan these xperiences.

Persons preparing for teaching or for work in other human services elds require a well-rounded education. Therefore, a student completing he teacher certification program will take from 72 to 96 semester hours n the liberal arts. Liberal arts courses and selected professional education ourses may be completed at George Washington University or may be ccepted for advanced standing from another accredited institution in ccordance with regulations on page 111.

Experienced registered nurses and persons engaged in related health ervices or other human services areas may fulfill the requirements for a .A. in Education and Human Development in the field of human services y completing 120 credit hours.

eneral Information for Freshmen and Sophomores

ll undergraduates admitted directly to the School of Education and uman Development are assigned academic advisors at the time of ad- ission. Advisors are designated to provide continuity of advising for udents throughout their years of undergraduate study. The program for ch student must be approved by a faculty advisor.

Since each student's program is defined by individual needs, it is portant that students have a clear concept of their major interest in

education, and that they be familiar with the certification requirem of those localities in which they expect to teach. Information on s licensing requirements is available in the Career Services Office, loc in Woodhull House, 2033 G St., N.W.

Entrance Requirements for Freshmen and Sophomores

Good character and an academic background appropriate for the prog of studies contemplated are required.

Requirements for admission to the freshman and/or sophomore ye are as follows:

1. An acceptable certificate of graduation from an accredited second school, showing at least fifteen units* which must include four years English; at least two years of one foreign language; two years of scien preferably with laboratory instruction; two years of social studies, of which must be American history; and two years of college preparat mathematics.

2. The principal's statement that the applicant is prepared to undert college work.

3. College Entrance Examination Board scores submitted on the Sc lastic Aptitude Test.

It is recommended that the examinations be taken in December January of the senior year. Scores on tests taken in the junior year m be submitted. Arrangements for tests are the responsibility of the ap cant and should be made with the Educational Testing Service, 20 Nas St., Princeton, N.J. 08540; or 1947 Center St., Berkeley, Cal. 947 not less than one month before the date of the test. In applying for test, the applicant should specify that the scores be sent to the Office Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; howev the American College Testing battery scores will be accepted. The ap cant should request that these scores be sent to the Office of Admissi directly from the American College Testing Program, Iowa City, Iowa. is recommended that the applicant take the tests in October of the sen year.

The School of Education and Human Development will consider adequacy of the qualifications of an applicant who, because of unus circumstances, does not present all of the formal requirements sta above. The School may require appropriate scholastic-aptitude tests.

International students may be considered for admission with an equi lent foreign secondary certificate. A student presenting such a certific must also show competence in the English language and may be requir to enroll in a full-time program in English as a Foreign Language bef beginning studies in a degree program. Requirements will be determi on the basis of an English Proficiency Test administered on-campus. candidate who submits a score of 580 or above on the Test of Engl as a Foreign Language (TOEFL) may be excused from taking further cou work in English as a Foreign Language, but will be required to take English Placement Examination on campus.

* A unit represents a year's study in a secondary school subject, including in the aggregate less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

Students who have been out of secondary school for three years or more or do not meet the above requirements may take a special battery of admission tests (including among others, the Differential Aptitude Test, Cooperative English Examination, and Ohio Psychological Test) by contacting the Office of Admissions or may be considered for admission on probation to the School of Education and Human Development. A student admitted on probation is required to complete a trial program of 15 semester hours of course work with a quality-point index of 2.25 (C+) or higher. The selection of courses to be taken in the trial program must be made in conference with a faculty advisor.

Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities, and from other divisions of this University, are as follows:

Students who have accumulated 15 hours or more of academic credit at another regionally accredited college or university with an acceptable program and acceptable grades may be admitted to the School of Education and Human Development. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of *C* or better, and may be applied toward a degree provided that such courses are comparable to the curriculum requirements of the degree at GW.

Although a grade of *D* in a course is not acceptable for transfer, the course may be used to satisfy a curriculum requirement. Credits earned with a *D* grade may not, however, be counted toward advanced standing.

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Students may transfer from another division of this University into a degree program in the School of Education and Human Development. The student must present an accumulated quality-point index of 2.00 or higher at the time of transfer. A student wishing to transfer into the School from another division of this University must submit a formal application of transfer to the Office of Admissions and meet other requirements for acceptance to the School.

Courses taken at another division of this University may be applied toward a degree in this School provided they are comparable to the curriculum requirements of the degree.

Nurses filing for admission to the B.A. program in Human Services are required to submit a copy of their current state nurse's registration (license) in addition to the official transcripts. Nurses may be awarded advanced standing for work completed in a community or junior college program. They may also receive advanced standing up to 30 credit hours for work completed in a two-year teaching hospital program; 45 credit hours may be granted for work completed in a three-year teaching hospital program.

Students applying for transfer from another accredited college or

university or from another division of this University whose previ academic records raise doubts of their ability to complete degree requ ments successfully may be admitted to the School of Education and Hur Development on probation. To be admitted into the School's deg program, a conditionally admitted student must complete a prescribed t program of 15 semester hours of course work with a quality-point in of 2.25 or higher. A student registered in another division of this Univers who has an accumulated quality-point index of less than 2.00 and wh conditionally admitted to this School must earn a 2.25 quality-point in in the trial program and must during this trial program bring the accu lated quality-point index to 2.00 or higher to be admitted to the Scho degree program.

The selection of courses to be taken in the trial program must be mad conference with a faculty advisor in the School of Education and Hur Development. A conference concerning plans for study as a degree c didate is required of each applicant at the beginning and end of the t program. Upon successful completion of the trial program, the student w has submitted a degree-candidate application will be advanced to deg status.

Requirements for the Degrees

To be recommended for a degree a student must satisfy the admissi residence, scholarship, and curriculum requirements. The Bachelor of A in Education and Human Development (elementary, middle school, s secondary education, elementary education/early childhood educat and elementary education/special education) requires 126 to 132 semes hours; the Bachelor of Arts in Education and Human Development (hum services) and the Bachelor of Science in Human Kinetics and Leis Studies (dance therapy) require 120 semester hours; the Bachelor of S ence in Human Kinetics and Leisure Studies (elementary/secondary phy cal education, dance education, and dance as a performing art) requi 124 semester hours.

RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily a mi mum of 30 semester hours while in the School of Education and Hum Development.

DEAN'S LIST

To be eligible for the Dean's List a full-time student must obtain a quali point index of 3.5 on courses completed during the past semester. A pa time student, to be eligible, must obtain a quality-point index of 3.5 on t last 12 semester hours of course work. Such part-time students must ha been enrolled for at least one three-hour course each semester, and re dence during the period involved must be continuous.

SCHOLARSHIP REQUIREMENTS

For the system of grading and of computing scholarship, see page
In order to graduate, a student must have a quality-point index of

least 2.25. A quality-point index of at least 2.25 is required before permission is granted to do student teaching in the senior year.

Probation—A student who fails to maintain a quality-point index of at least 2.25 is placed on probation. The student remains on probation as long as the index is below 2.25, or until probation is removed by the Committee on Scholarship.

Suspension—A student on probation who fails to raise the index to 2.25 within the time specified may be suspended.

A student suspended for poor scholarship may, within 10 days, appeal the case through the dean to the Committee on Scholarship. If the case appears to be remediable and the student's scholarship seems likely to improve, the Committee may readmit the student on probation. A student denied readmission may again, after a lapse of a calendar year, petition the Committee through the dean for readmission. A student suspended twice will not be readmitted.

CURRICULUM REQUIREMENTS

In all bachelor's curricula at least 30 semester hours must consist of courses numbered above 100.

PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better, may, with the approval of an advisor and the dean, take one course a semester and receive a grade of *P* (Pass) or *NP* (No Pass) which will be recorded on the student's transcript but will not be reflected in the student's quality-point index. No student will be allowed to take more than four pass/no pass courses. Students must sign up for such an option at registration. Students may change from pass/no pass status to graded status, or vice versa, after the end of registration only with the permission of the dean and the course instructor. Courses required in the student's major field may not be taken on the pass/no pass basis. A transfer student may not choose this option until the second semester of enrollment at this University.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—When a grade of *I* is assigned, the instructor should normally set a period within which the uncompleted work (usually the final examination or a required paper) must be made up. When required work has been completed, it is the responsibility of the instructor to change the grade of *I*, as appropriate. If work is not completed, the instructor will decide whether to change the grade of *I* to *F*, or to allow the *I* grade to remain. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

National Teacher Examination

The National Teacher Examination is optional for Education students. Students who take the Examination receive individual reports of test

scores and may avail themselves of the regular transcript services of the Educational Testing Service.

Teaching-Field Programs

SUBJECT-AREA SPECIALIZATION

Subject-area specialization depends upon the teaching position for which the student is preparing. Those planning to teach in elementary schools need a degree of competency in several fields. Those preparing to teach in middle schools must acquire competency in a chosen interdisciplinary subject-matter specialization. Those preparing to teach in junior or senior high schools must demonstrate competence in a major teaching field. A minor teaching field is optional, but recommended. The student should begin teaching-field preparation during the first two years.

Teaching-field requirements for secondary education majors, developed in cooperation with appropriate departments of the University, include satisfactory completion of prescribed academic courses in one or more fields and satisfactory completion of the prescribed special methods courses. Prescribed academic courses vary in number in accordance with the scope and complexity of the teaching field and the licensing requirements of the various states.

Professional Education

The basic professional information, skills, and attitudes needed by beginning teachers are provided through a sequence of courses to be taken throughout the four years of undergraduate study. Lectures and class discussions are closely coordinated with field work. Instruction is differentiated to meet the needs of those preparing to teach on the various levels—elementary, middle, junior high, and senior high school.

The prescribed courses in special methods are concerned primarily with methods of initiating, guiding, and evaluating learning experiences dealing with the content of teaching fields. They attempt to bring to the student specific suggestions drawn from the accumulated experience of successful teachers. In addition, the courses review the teaching-field content currently in use in schools.

Education Curriculum

The following is the curriculum for the first two years in preparation for the Bachelor of Arts in Education and Human Development degree with major fields in elementary or secondary education, elementary education/early childhood education, and elementary education/special education.

		Semester Hours
Education:	Educ 101, 102, 103, 104	12
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	12
Mathematics:	Math 9 and 10 (for students in elementary education and double-major programs); two semesters chosen from Math 3, 6, 9, or 10 (for secondary education majors)	6

		Semester Hours
Science:	Three semesters (two in biological science and one in physical science or vice versa) for students in elementary education and double-major programs); two semesters for secondary education majors. Courses are to be chosen from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; or Phys 1 and 2, or 9–10	6–9
Social Sciences:	Hist 71 or 72 and another social science course (for students in elementary education and double-major programs; Hist 71–72 or PSc 1 and 2 for secondary majors)	6
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2; Soc 1 and 2	6
Speech and Drama:	SpDr 1 or as approved for secondary majors; SpDr 11 for students in elementary education and double-major programs	3
HKLS:	For students in elementary education and double-major programs	3
Electives:		6–9
	Total	60–63

Human Kinetics and Leisure Studies Curriculum

Students interested in the Bachelor of Science in Human Kinetics and Leisure Studies with a specialization in elementary/secondary physical education will be admitted to the major in human services to complete the following courses during the first two years and will be admitted to the major in elementary/secondary physical education in the junior year. (Students should begin to acquire competency in several physical activities in the first two years.)

		Semester Hours
Education:	Educ 102 and 103	6
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	12
HKLS:	Four semester hours selected from first-group HKLS courses (59, 60, 61, 62 recommended); HKLS 102, 103, 111–12, 130, 139, 150, 151	28
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9 and 10; or Phys 1 and 2, or 9–10	6
Social Sciences:	Hist 71–72 or PSc 1 and 2	6
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2; Soc 1 and 2	6
	Total	64

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree with a specialization in dance education:

		Semester Hours
English:	Engl 9 or 10 and 11	6
HKLS:	HKLS 107, 108, 150, and 157	12
	Any combination of dance courses numbered 10–58, 121 or 123	16
Education:	Educ 102, 103	6
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9–10; Phys 1–2, or 9–10	6
Social Sciences:	Hist 71–72 or PSc 1 and 2	6
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; PSc 1 and 2; Soc 1 and 2	6
Speech and Drama:	SpDr 1, 11, 121 or 169	3
Electives:		3
	Total	64

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students interested in dance as a performing art:

English:	Engl 9 or 10 and 11	6
HKLS:	HKLS 150, 157	6
	Any combination of dance courses numbered 10–58, 121 or 123	6
Humanities:	Art 21–22, 31–32; Music 1, 3 or 4; Phil 50; SpDr 45	6
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2, 5; Math 3, 6, 9, 10; Phys 3, 4, 9, or 10	6
Social Sciences:	AmCiv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40, 71–72; PSc 1 and 2; Psyc 1, 5–6, 8, 22, 29; Soc 1 and 2	6
Electives:		24
	Total	60

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students in dance therapy:

English:	Engl 9 or 10; 11 or 12	6
Speech and Drama:	SpDr 2, 115, or 121	3
Humanities:	One philosophy, music, or art history course	3
Science:	BiSc 3-4	6
Social Sciences:	Psyc 5, 101, 110, 119, 122; Soc 1; Anth 2	22
Education:	Educ 102 and 103	6
Dance Technique:	Courses chosen from HKLS 10–58; HKLS 121, 123	10
Electives:	Three courses chosen from Psyc 8, 108, 118, 151 are recommended	9
	Total	65

The teaching-field programs and their requirements are as follows:

Elementary Education Program

GENERAL EDUCATION REQUIREMENTS (See pages 114-15)

SUBJECT-AREA SPECIALIZATION

The requirements are three semester hours each, to be selected with approval of the advisor, of art and music survey courses (may be taken on a *P/NP* basis) and HKLS courses; 9-12 hours of science courses (must include courses in both physical and biological sciences) and 6 hours of social science courses, to be selected with approval of the advisor; Econ 1; Geog 1 and 2; Hist 71 or 72; Math 9, 10. (Some of these courses are listed under requirements on pages 114-15.)

PROFESSIONAL COURSES: ELEMENTARY EDUCATION

Thirty-six credit hours are required, consisting of Educ 105, 110, 111, 112, 128, 135. These courses are in addition to Educ 101, 102, 103, and 104 taken during the first two years.

Elementary Education/Special Education: Complementary Teacher Program

GENERAL EDUCATION REQUIREMENTS (See pages 114-15)

SUBJECT-AREA SPECIALIZATION (see elementary education program above)

PROFESSIONAL COURSES

In addition to the professional courses listed for elementary education, the required courses in special education are SpEd 102, 189, 170, 103, 190, 101, 199, 160, and 168.

Elementary Education/Early Childhood Education

The general education, subject-area specialization, and professional courses are the same as those required for elementary education. In addition, students are required to complete Educ 132, 150, 152, 153, and 154.

Middle School Education Program

The middle school education program offers four teaching-field specializations together with appropriate professional training. While the importance of a thorough understanding of the nature of the middle school learner and the middle school is emphasized, equal stress is placed on early and continued direct experiences in the middle school. This experience culminates in a senior-year block instructional program conducted largely in the field.

GENERAL EDUCATION REQUIREMENTS (See pages 114-15)

SUBJECT-AREA SPECIALIZATIONS

Communications: 30 credit hours
Life Science: 30 credit hours
Earth/Space Science: 30 credit hours
Social Science: 30 credit hours

PROFESSIONAL COURSES

Thirty-six credit hours are required, consisting of Educ 105, 110, 112, 134, a special methods course selected from Educ 136, 137, 138, and 144, and electives planned with an advisor.

Secondary Education Programs

In the secondary education program a number of teaching-field specializations are offered. However, it is strongly recommended that, wherever possible, a candidate undertake the equivalent of a minor in an interdisciplinary subject area. Early counseling by the program advisor is urged to ensure a balanced and realistic program of study. The requirements in the secondary education program are as follows:

GENERAL EDUCATION REQUIREMENTS (See pages 114-15)

SUBJECT-AREA SPECIALIZATIONS

Art—42 credit hours, including Art 1 and 31-32 or 71-72, and two second- or third-group art history courses if open to undergraduates; Art 137; 24 credit hours to be selected from the following: Art 21-22, 23-24, 41-42, 51-52, 57-58, 65-66, 81-82, 123-24, 125-26, 127-28, 131-32, 143-44, 151-52, 153-54, 159-60, 163-64, 166, 179-80, 181, 182, 189-90, 235.

Biology—44 credit hours, including BiSc 11-12 and 24 hours of upper-level courses in the biological sciences. A minimum of 6 hours each must be taken from biology, botany, and zoology, plus Chem 11-12 and 50.

Chemistry—40-44 credit hours, including Chem 11-12 and 22 or 15-16, 110 or 111, 134, 151-52, 153-54, 191; Math 6, 30, 31; Phys 1 and 2.

Earth Science—49-52 credit hours, including BiSc 3-4; Chem 11-12; Geol 21-22, 101, 111, 125, 151; Math 3 and 6; Phys 1; 6-9 additional credit hours, as approved by the advisor, to be selected from the following: Anth 186; Geol 122, 128, 141, 163, 189.

English—39 credit hours, including Engl 9 or 10, 11 or 12, 52, 71-72, 101, 115, 127-28; SpDr 11; and nine credit hours to be selected from the following as approved by the advisor: Engl 117-18, 133-34, 135-36, 153-54, 155-56, 161-62, 163-64, 165-66, 167-68, 171-72, 173-74, 175-76, 177-78.

French—42 credit hours, including Fren 9, 10, 51-52 or 91-92, 103, 108, 109, 110, and two full-year second-group French literature courses; 6 semester hours from the following: Art 109, 110; Engl 115; a foreign language other than French as approved; Hist 141-42; Psyc 115.

General Science—43-45 credit hours, including BiSc 3-4; Chem 11-12 or 15-16, and 22; Phys 1 and 2 or 9-10; 10 additional credit hours in science as approved by the advisor; 9 credit hours of math to be selected from the following: Math 3, 6, 30, 31, 32, 33.

Geography—24 credit hours, including Geog 1 plus 21 credit hours to be selected from the following: Geog 104, 105, 106, 125, 127, 132, 134, 135, 140, 141, 142, 143, 145, 146, 154, 161, 198.

German—33 credit hours, including Ger 9-10, 51-52, 179-80, and 15 additional credit hours in German as approved by the advisor.

History—42 credit hours, including Hist 39-40 and 71-72; 6 credit hours of a history research seminar; 6 credit hours in each of the three following groups as approved by the advisor: Europe; United States; and Russia, Asia, Africa, and Latin America; 6 additional credit hours as approved by the advisor, in any one of the preceding groups.

Mathematics—39 credit hours, including Math 30, 31, 32, 33, 121, 123 or 124, 135; three additional second- or third-group mathematics courses approved by the advisor; Stat 97, 157-58.

Music—48 credit hours, including Mus 5-6, 102, 103-4, 131-32, 138, 151; 6 credit hours of applied music in voice or a major instrument; 12 credit hours of applied music in minor instruments; 3 credit hours of choral or orchestral ensemble; piano, voice, and guitar must be included.

Physics—36 credit hours, including Math 30, 31, 32, 33; Phys 14, 15, 16, 161, 163, 164, 165, 167.

Russian—36 credit hours, including Slav 9-10, 91-92, 109-10, 161-62. Recommended electives include Slav 101, 125, 141, 151, 152, 165, 166.

Social Sciences—42 credit hours, including Econ 1-2; Hist 39-40, 71-72; PSc 1 and 2; 6 credit hours to be selected from the following: Anth 1-2; Geog 1, 2; Soc 1, 2; plus 12 credit hours of second-group courses, as approved by the advisor, from anthropology, economics, geography and regional science, history, political science, and sociology.

Spanish—42 credit hours, including Span 9-10, 51-52 or 91-92, 109-10; three full-year courses selected from second-group Spanish or Spanish-American literature courses; 6 credit hours to be selected from the following: Engl 115; a foreign language other than Spanish as approved; Hist 161, 163-64, 165, 166; Psyc 115.

Speech and Drama—36 credit hours, including SpDr 1, 11, 45, 49, 101, 103, 110, 112, 121; plus 12 credit hours to be selected from speech communication or drama courses, as approved by the advisor.

PROFESSIONAL COURSES*

The requirements are 21 to 27 credit hours, consisting of Educ 105, 223 (for undergraduate credit), 112, 131, 134 (6-9 credit hours), and 3 credit hours selected from Educ 136, 137, 138, 139, 140, 144, 146. These courses

* A course in the teaching of reading is recommended since it is required for employment in many jurisdictions.

are in addition to the following courses, usually completed during the first two years: Educ 101, 102, 103, 104.

Bachelor of Science in Human Kinetics and Leisure Studies

The program, which is designed to prepare students for teaching in elementary and secondary schools, offers opportunities for specialization in dance education and elementary/secondary school physical education. Programs are also offered in dance as a performing art and dance therapy for persons not interested in certification for teaching.

Prerequisite—For the first two years of the Bachelor of Science in Human Kinetics and Leisure Studies curriculum, see pages 115-16.

Specialization in Dance Education, junior and senior years—The following courses are required: Educ 104, 105, 112; HKLS 109-10, 117, 119, 133, 135-36, 137, 141-42, 144, 150, 151, 175, 200; plus 9 credit hours of electives.

Specialization in Dance as a Performing Art, junior and senior years—The requirements consist of 20 credit hours selected from HKLS 10-58, 121, or 123; and HKLS 108, 109-10, 120, 135-36, 137 or 200, 141-42, 144, 173, 175; plus 9-11 credit hours of electives.

Specialization in Dance Therapy, junior and senior years—10 credit hours selected from HKLS 10-58; HKLS 106, 107, 108, 109, 110, 113 or 114, 117, 119, 120, 136, 137, 141, 142, 144, 150, 157, 173, 175, 184.

Specialization in Elementary/Secondary Physical Education, junior and senior years—Sixty credit hours are required: SpDr 1 or 11; Educ 104, 105, 112; HKLS 113, 114, 129, 138, 158, 164, 171, 133; plus 12 hours of an HKLS area of concentration and nine hours of electives.

Bachelor of Arts in Education and Human Development—Program in Human Services

The program in Human Services is designed for personnel in the following representative types of human service fields: nursing, gerontology, mental health, criminal justice, etc.

The program in Human Services is planned to: (1) enable individuals to develop their cognitive and affective abilities; (2) meet a range of human services needs; (3) develop human interaction and leadership skills; (4) facilitate entry into or advancement in human services occupations; (5) gain an awareness and appreciation for interacting values in a pluralistic society; and (6) prepare for graduate study in a professional field.

The program features a variety of fieldwork and classroom lectures, seminars, and consultation. Opportunities are provided for acquaintance with diverse human service settings and professionals in the field, and for academic concentration in departments throughout George Washington University.

Programs for students will be individually planned after an evaluation is made of previous professional and educational experiences and long-range goals.

Advanced standing may be awarded for liberal arts and specialization courses completed at accredited colleges and universities. Advanced standing will be granted for registered nurses who have completed two- or three-year programs at accredited teaching hospitals—30 credit hours for two-

year programs and 45 credit hours for three-year programs. Credit will be recognized for courses completed in the sciences, but not in the other liberal arts.

Students will be required to complete the following liberal arts requirements for the degree either in previous work at another accredited institution of higher education or at George Washington University.

		Semester Hours
English:	Engl 9 or 10 and 11; 51 or 52	9
Mathematics:	Math 3, 6, 9, or 10	3
Psychology:	Psyc 1	3
Science:	BiSc 3, 4; Chem 3, 4; Geol 1, 2; Phys 1, 2; Phys 9, 10	6
Social Sciences:	Hist 71–72; PSc 1, 2; Anth 1–2; Soc 1, 2; Econ 1–2; Geog 1, 2	6
Speech and Drama:	SpDr 1, 11, or 111	3

Core courses include Educ 101, 102, 103, 104, 105, 124, 133 or SLP 152, and nine additional credit hours to be chosen in consultation with the advisor.

Concentrations of 12 to 24 hours may be selected in the following fields: administration; adult education/human resource development; consumer affairs; early childhood education; mental health; movement studies; early childhood special education; therapeutic recreation; travel and tourism; and vocational special education. In addition to the concentrations listed, degree candidates have the option of designing an area of concentration in other divisions of the University in cooperation with the academic advisor.

Teaching Emphases for Majors in Elementary Education and Secondary Education

The School of Education and Human Development offers courses and programs that are educationally sound and enriching and that enhance opportunities for graduates to obtain teaching positions throughout the United States. Special teaching emphases have been developed, consisting of courses which students are encouraged to select to satisfy elective hours in their programs in elementary or secondary education.

Teaching emphases are offered in the following areas:

Guidance and Counseling
Movement Education
Reading
Speech Pathology and Audiology

Most teaching emphases are designed to focus on areas of recognized need for elementary and secondary pupils throughout the nation, particularly those in large urban centers. Graduates of these programs, with their added skills and understandings in these critical areas, should be attractive candidates for teaching positions.

A field that has experienced significant growth, both nationally and internationally, is tourism and travel. The academic advisor in tourism will try to assist students who select this sequence to find part-time work in travel agencies and bureaus to enhance classroom experience.

Many of the courses offered in the teaching emphases have been taken directly from master's degree programs of the School of Education and Human Development and assigned undergraduate numbers.

Students interested in more detailed information about these seque are encouraged to contact the Dean's Office, School of Education Human Development, or their academic advisors.

The following represents a breakdown of the specific courses off in each of the teaching emphases:

Guidance and Counseling: Educ 161, 162, and 163.

Movement Education: HKLS 101, 102, 113, 129, and 130.

Reading: Educ 100, 110, and 111.

Speech Pathology and Audiology: SpDr 1, 101, 103, 104, 108, 118, 119, Psyc 115.

GRADUATE STUDY

The School of Education and Human Development offers graduate p grams leading to the degrees of Master of Arts in Teaching, Master Arts in Education and Human Development, Education Specialist, Doctor of Education.

GRADES

For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Mi mum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdraw *Z*, Failure, Unauthorized Withdrawal; *CR*, Credit. Grades *A*, *B*, *C*, and are counted in computing the quality-point index (see page 45).

Whenever a grade has not been assigned, the symbol *I* (Incomplete) the symbol *W* (Authorized Withdrawal) will be recorded. The symbol indicates that a satisfactory explanation has been given to the instruct for the student's failure to complete the required work of the course. instructor recording a grade of *I* will normally stipulate a date by whi work must be completed. The instructor has the responsibility for changi the grade of *I* to an appropriate grade upon completion of work, or, if wo is not completed by the stipulated date, determining whether the grade *I* should be changed to *F* or allowed to remain in the record.

THE DEGREE OF MASTER OF ARTS IN TEACHING

The School of Education and Human Development offers an intensiv interdisciplinary fifth year in museum education. This program is designe to prepare selected liberal arts graduates, postgraduates, and professiona for education work in a museum or for liaison work between museum and school systems. Students receive the degree of Master of Arts Teaching upon completion of the program.

For details write the chairman of the Department of Education, M.A.T Program, School of Education and Human Development, George Washing ton University, Washington, D.C. 20052.

ADMISSION

To be admitted to the program in museum education an applicant must (1) have a bachelor's degree from an accredited institution; (2) submit three written references attesting to quality of academic record and work experience; and (3) be interviewed by the University Selection Committee or make alternative arrangements specified by the Committee and approved by the dean of the School of Education and Human Development. Considered essential are skills in communication, a desire to study and learn from the artifacts of nature and civilization, and an ability for and interest in working with people. Evidence of strong undergraduate, graduate, or professional experience in such fields as American history, geology, art, or the social sciences will be considered favorably.

PLAN OF STUDY FOR THE MUSEUM EDUCATION PROGRAM

The program begins with a six-week summer session. Emphasis is on the study of museums and communication skills. During the fall semester students study the school as an institution—its organization, pupil population, staff and services—and as a laboratory, where they will work in classrooms with students and teachers. The program will also focus on other museum audiences. Students will earn at least 12 semester hours of credit in an academic concentration. During the spring semester students will have an internship in area science, art or history museums.

THE DEGREE OF MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

Programs of study leading to the degree of Master of Arts in Education and Human Development are designed to enable prospective teachers and experienced teachers to increase their professional and academic knowledge and skills and to prepare for special types of educational service. They also provide opportunities for college graduates in other disciplines to acquire needed professional education, as well as study in the subjects which are directly related to their professional objectives.

Master's programs are available in the fields listed on the following pages.

Adaptive Physical Education

The primary goal of the adaptive physical education degree program is to make a contribution toward alleviating the shortage of trained personnel in physical education for handicapped persons. The program also serves to retrain physical educators for new roles in public school systems and developmental and rehabilitation settings. The program focuses upon the adaptive physical educator as part of the comprehensive treatment team; therefore a multidisciplinary approach is emphasized.

Adult Education

The program of study in the field of adult education prepares students for positions in educational institutions, voluntary organizations, and other institutions in the private or public sectors which sponsor adult learning

programs. The students enrolled in this program obtain the skills and
derstandings required to perform functions associated with the ro
of learning specialist, administrator, counselor, and consultant in
field of adult education.

College Student Development

The master's degree program in college student development provides
academic, professional, and philosophical preparation for entry-le
positions in the field of student affairs. The program provides educati
in administration, counseling, group facilitation, leadership training, a
organizational development. Many graduates are employed in colle
and universities in the areas of career development, international stud
advising, residence hall programming, financial aid, student affairs researc
student activities, admissions, and counseling.

Curriculum

The master's degree program in curriculum has been developed to ass
educators in meeting state licensing requirements for school administrati
and supervision. Courses cover a broad range of theory and practice a
are appropriate for non-school-based agencies and for educators co
cerned with program or learning media development.

Dance

The master's degree program in dance is designed to prepare dan
specialists for roles in the areas of choreography, therapeutic dance, dan
education, performance, or for specific areas of specialization, i.e. criticis
history, research. The student plans with the advisor a course of study th
considers individual background, professional interests, and career goal
Students from a variety of disciplines are accepted into the degree pr
gram.

Early Childhood Education

The master's degree program in early childhood education prepare
teachers, directors, and supervisors in nursery schools, day care center
and kindergartens, as well as researchers and program specialists in th
field.

Elementary Education

The master's degree program in elementary education is planned to hel
teachers continue their professional growth and advance in competenc
in their work in regular elementary school classrooms. The program ma
be used to develop an academic specialization for work with elementar
school children, or to explore fields of specialization for present or futur
professional goals.

Elementary/Secondary Administration

The graduate program in educational administration is designed to pre
pare students for leadership roles in public and private educationa
organizations. The master's degree program in elementary and secondar

administration is considered to provide the minimum entry-level preparation for the positions of principal, assistant principal, and head of department.

General Physical Education

This program permits students to take courses in allied areas and cognate fields to enhance their ability to compete for more varied employment opportunities in general physical education. The electives are planned by the student in consultation with the advisor and are based on background and professional goals.

Generic Counseling

The generic counseling program prepares individuals to do vocational, educational, or personal counseling in community or governmental agencies.

Gifted and Talented

This program is planned to help students to prepare themselves in a comprehensive and research-based manner to teach gifted and talented individuals; to design programs and prepare appropriate instructional strategies and materials for the gifted and talented; and to supervise or administer programs for the gifted and talented. Graduates will be prepared to work with gifted and talented individuals at a self-selected level, ranging from early childhood through adulthood.

Guidance and Counseling

The guidance and counseling program prepares individuals to be certified to work as counselors in elementary or secondary schools.

Higher Education

The higher education program affords the student a concentration in administration, teaching, or curriculum. Courses prepare students for administrative positions in areas generally encompassing college and university organizations: academic affairs, public relations, finance, and development.

Human Resource Development

The program of study in the field of human resource development is designed for persons either entering or advancing in positions associated with training, education, and development activities in business, industry, government, and other large organizations in the public or private sectors. The program prepares students with the skills and understandings needed for responsibilities as learning specialists, administrators, and consultants in this field.

Individualized Master of Arts

This program permits development of individualized programs which cut across existing fields, both within the School of Education and Human

placement. Graduates are now employed by travel-related business colleges and universities, national tourism agencies, resorts, and in ot travel/tourism organizations.

For teachers interested in developing or strengthening their acade competence, the Master's programs in elementary and secondary educati normally permit 15 to 18 semester hours of work in departments other th education. These programs are designed to meet the need of teachers- service who need additional work in content to qualify for advanced cert cation or to improve their classroom skills and may also be helpful previously trained teachers planning to re-enter the profession. The ma emphasis is upon strengthening both the academic and professional co petencies of the teacher.

Additional information concerning these programs may be obtained writing or telephoning the office of the dean.

ENTRANCE REQUIREMENTS FOR THE MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

A bachelor's degree from an accredited institution and an undergradua quality-point index of 2.50 or above (C+ average) are required. Studen whose quality-point index is in the range of 2.3 to 2.49 will be considere for provisional admission. The quality-point index is computed on th basis of the last two years of the bachelor's degree program and on a course work completed beyond the baccalaureate.

Two years of successful teaching are required before admission to can didacy in the field of elementary/secondary administration. Experienc may be required for admission to programs in adult education and huma resource development.

Candidates whose undergraduate preparation does not include equiva lents of the basic requirements for the degree of Bachelor of Arts in Edu cation must make up deficiencies and may be required to take designate tests.

An interview in the office of the dean is required for applicants wh live in the Washington, D. C., metropolitan area; a letter of reference is re quired of all other applicants.

ADVANCED STANDING

Advanced standing is granted for approved courses taken at other ac credited institutions, but a minimum of 24 semester hours must be com pleted at this University as a master's candidate.

A maximum of 12 semester hours of advanced courses completed in this University in excess of the requirements for the bachelor's degree may be credited toward the master's degree if the work fits in with the student's plan of specialization.

Advanced standing is not granted for work completed five or more years before application for admission or readmission to master's candidacy.

PLAN OF STUDY

The plan of study leading to the degree of Master of Arts in Education and Human Development requires a minimum of 33 hours of graduate

credit. The plan may, at the student's option, include a thesis carrying six hours of graduate credit. Whether or not a student selects the thesis option, a minimum of 18 hours must be from courses planned primarily for graduate students (third-group courses). A minimum of 12 hours, not including the thesis, must be from courses offered by the School of Education and Human Development.

Programs may include additional teaching-field preparation. In such cases, however, undergraduate and graduate courses combined must be at least equivalent to the undergraduate requirements for the degree of Bachelor of Arts in Education and Human Development.

Programs are planned initially in conference with an admission advisor in the School of Education and Human Development and subsequently with a designated advisor in the candidate's area of specialization. These programs are based on the candidate's interests and background and on the certification requirements of the state and locality in which the candidate plans to teach.

All degree requirements must be completed within six years.

RESIDENCE

A candidate for the master's degree is required to complete satisfactorily 24 semester hours in residence.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive the grade of *C* in more than six semester hours are subject to suspension. Students who receive a grade of *F* must confer with the dean before enrollment for further work.

THE THESIS

The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statement of the School of Education and Human Development standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends beyond the additional time granted, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER'S COMPREHENSIVE EXAMINATION

Candidates in M.A. programs requiring 33 semester hours may, with the approval of their academic advisors, elect to take an additional three-semester-hour course in lieu of a comprehensive examination. Candidates in programs whose basic requirements exceed 36 semester hours may waive the comprehensive examination with approval of the academic

advisor. Candidates who plan to take the examination must be register in the semester it is to be taken and must file a written application in t office of the School of Education and Human Development no later th 30 days prior to the date of the examination. Comprehensive examinatio are required of students in Early Childhood Education, College Stude Development, Gifted and Talented, Reading, and all programs in Hum Kinetics and Leisure Studies.

THE DEGREE OF EDUCATION SPECIALIST

The program of advanced study leading to the degree of Education Sp cialist is for students with master's degrees in education who seek furth professional preparation for specific objectives.

Education Specialist programs are available in the fields of administr tion, adult education, counseling, curriculum, higher education, and huma resource development.

Entrance Requirements

The degree of Master of Arts in Education and Human Development, equivalent; two years of pertinent experience in education; a gradua scholastic average of at least 3.3 or a 50th percentile score on the Gradua Record Examination or Miller Analogies Test are required. A score on o of the specified tests must be submitted as part of the admission pr cedures.

Each applicant must be interviewed and recommended by a facul advisor in the major field who will submit a tentative program plan pri to admission.

Scholarship

Scholarship requirements for the degree of Education Specialist are th same as those for the degree of Master of Arts in Education and Huma Development (see page 129).

Programs of Study and Degree Requirements

Individual programs are developed, through the faculty-advisor plan, to f the candidate's skills, interests, and career goals. A minimum of 3 semester hours beyond the requirements of the degree of Master of Ar in Education is required. At least 21 hours of this work must be take on campus at this University; with the approval of the advisor, the remai ing semester hours of the program may be taken in off-campus offering of the GWU College of General Studies or at another approved universit A maximum of five calendar years is allowed for completion of th program.

At least 12 of the required 30 hours must be in appropriate gradua courses in education selected from the following areas: (1) foundations an cognate study, (2) background and general principles of the field of study (3) an area of specialization.

The Comprehensive Examination

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

THE DEGREE OF DOCTOR OF EDUCATION

The School of Education and Human Development offers programs of advanced study leading to the degree of Doctor of Education. These programs, which are under the supervision of the Advanced Graduate Faculty, provide major fields of study in teacher education, special education, counseling, administration and curriculum, adult education, human development, human resource development, and higher education. Supporting fields are available in administration, administration of higher education, adult education, college student development, counseling, curriculum, elementary education, higher education, human growth and development, human resource development, international education, reading, secondary education, special education, supervision, teacher education, and tourism development and travel administration. With the approval of the Advanced Graduate Faculty and the departments concerned, one supporting field may be taken in other departments of the University. All programs require study of interrelated areas of education and a doctoral dissertation in the major field of study.

Admission

The applicant must have adequate preparation for advanced study, including graduate work in fields prerequisite to his or her objective, equivalent to that required for the degree of Master of Arts in Education at this University, at least three years of successful pertinent educational experience, acceptable personal qualities, and a capacity for creative scholarship and effective leadership.

The applicant first arranges for an interview with the assistant dean to explore the applicant's needs in relation to the resources of the School and to guide the student in applying for doctoral study. The required procedures and standards will be explained at this time. Candidates meeting the initial standards are admitted to precandidacy for the degree.

PRECANDIDACY

In the precandidacy period a minimum of nine semester hours of course work in the program, including requirements specified by the Advanced Graduate Faculty, must be completed. This work must be completed within three semesters of admission to precandidacy, for part-time students, or within the first 18 semester hours of course work for full-time students. Application for full candidacy will then be decided on the basis of the quality of scholarship in the precandidacy period, the recommendations of instructors, a detailed plan for the balance of the program, and a qualifying examination.

Plan of Study

In general, from two to three years of full-time study beyond the degree of Master of Arts in Education, or the equivalent in part-time study, are

required. Programs are individually planned. It is estimated that, for th average student, the work required for the total program will be 7 semester hours, including a minimum of 12 semester hours of dissertatio research.

Each program is divided into two parts. The first consists of preparatio for comprehensive examinations in a major field of study and two sup porting fields, and completion of a required research tool field. The secon is composed of research investigation, the writing of a dissertation, an the final oral examination.

Students who have completed the comprehensive examinations mus register for a minimum of six semester hours of *Dissertation Researc* (Educ 491) per semester until 12 hours have been completed, and a mini mum of three semester hours a semester thereafter, up to a total of 2 semester hours, until the satisfactory completion of the final examinatio

COMPREHENSIVE EXAMINATIONS

Upon admission to doctoral candidacy the student is assigned to a com mittee, each member of which is responsible for guiding the preparatio for one of the required comprehensive examinations in supporting field or the major field comprehensive examination. The candidate must arrang individual conferences with the committee members to determine th content of each field and to receive guidance in preparation for th examination.

The supporting field examinations, which are taken first, are three-hou written examinations. In addition to the research tool field a student wh plans a historical research investigation for the dissertation may be re quired to complete an appropriate research seminar offered by the Depart ment of History. The tool requirement must be completed prior to th major field examination. The major field examination is a written 12-hou examination, six hours on each of two successive days.

The candidate begins the second part of the program after the satis factory completion of all supporting field examinations, the required research tool field and the major field examination.

THE DISSERTATION

A dissertation is required as evidence of ability to perform scholarly re search and to interpret and present its results.

During the first part of the program, the dean appoints a dissertatio committee, consisting of a chairperson (usually a major field advisor) an two additional faculty members. The candidate is required to submit a proposal for the dissertation to this committee, which determines its ac ceptability. The dissertation is completed under the guidance of the chair person, with the advice of the other members of the dissertation com mittee.

No later than the date specified in the calendar, the candidate must submit to the dean five complete copies of the dissertation and two copies of an abstract for inclusion in the announcement of the examination and for reproduction by University Microfilms, Inc. Printed copies of detailed

regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available in the office of the dean. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover the expense of printing the Announcement of the Final Examination and to cover the basic service rendered by University Microfilms, Inc., and to sign a microfilm agreement.

THE FINAL EXAMINATION

When the dissertation has approval of the director, the candidate is recommended to the dean for the final oral examination, which must be passed at least three weeks before the degree is to be conferred. The examination is open to the public and is conducted by a committee of the faculty, appointed by the dean, supplemented by at least two leaders in the candidate's field of study from outside the University. Candidates who successfully pass the oral examination are recommended for the degree by the faculty of the School of Education and Human Development.

Residence and Continuous Study

All the preparation for the degree, including examinations, courses, seminars, and other work done under the direction of an advisor, must be done in residence. The student must be continuously enrolled in the School of Education and Human Development, unless the dean or the Advanced Graduate Faculty grants a leave of absence. Failure to register each semester of the academic year may result in lapse of candidacy. Subsequent readmission is subject to whatever new conditions and regulations have been established by the Advanced Graduate Faculty.

The supporting and major field examinations must be completed within five years of the date of admission, and the entire program must be completed within eight years, regardless of full-time or part-time study. All candidates must satisfy one of three options for full-time study. Information concerning these plans will be provided by the assistant dean upon request by the candidate.

SPECIAL PROGRAMS AND SERVICES

Graduate, Undergraduate, and Non-degree Training of Personnel Serving the Handicapped

The School of Education and Human Development offers various programs for the education of personnel serving the handicapped. Field-based training experiences are arranged throughout the metropolitan area. Students are accepted at the undergraduate, master's, and doctoral levels. Regular education and special education teachers and school administrators, as well as students from other schools and colleges at the University, may elect these courses. Inquiries concerning the programs and the availability of scholarships and fellowships should be directed to Dr. Rita Ives, Department of Special Education, George Washington University, Washington, D. C. 20052.

Graduate Program in Rehabilitation Counseling

This federally funded master's degree program trains rehabilitation coun selors to assist those who are disabled or disadvantaged to assume a plac in society. The 51-credit-hour program combines fieldwork and coursewor in preparing students for employment in an expanding field that yields hig humanitarian rewards. Both the profession and the program are inter disciplinary, drawing upon such related areas as guidance, medicine, psy chology, social work, sociology, and special education.

Inquiries concerning the program, the availability of traineeships fo full-time students and applications should be directed to Dr. Donald Lin kowski, Rehabilitation Counselor Education, George Washington Univer sity, Washington, D.C. 20052.

Graduate Specialization in Therapeutic Recreation and Adaptive Physical Education

This master's degree program in the field of physical education, with a specialization in therapeutic recreation or adaptive physical education, is funded by the Bureau of Education for the Handicapped, U.S. Departmen of Education. Inquiries concerning the program and the availability o graduate research assistantships and internships should be directed to the Chairman, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Therapeutic Recreation Technician Certificate Program

The Department of Human Kinetics and Leisure Studies offers a certificate program in therapeutic recreation. This prototype technician program trains paraprofessional personnel to work in a variety of settings, such as com munity recreation, state institutions, correctional facilities, and nursing homes. The curriculum emphasizes the therapeutic recreation proces and activity leadership skills. Students who complete the program will qualify for professional registration with the National Therapeutic Recrea tion Society. Students in the Human Services Program may participate in this program as an area of concentration in therapeutic recreation. Inquiries should be addressed to Ms. Andrea Morris, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Certification Curricula

The School of Education and Human Development provides individually planned programs for liberal arts graduates with appropriate degrees from accredited institutions who wish to prepare for teaching. Those seeking certification, but not wishing to work for a degree, may enroll in a certi fication program if they meet the admission, scholarship, and personality requirements of degree candidates. The School also provides a wide range of courses of interest to teachers who wish to renew licenses.

Reading Center

(See pages 53-54)

Off-Campus Degree Programs

The School of Education and Human Development offers off-campus programs leading to the degree of Bachelor of Arts in Education and Human Development in the field of human services and the Master of Arts in Education and Human Development in the fields of adult education, elementary education, higher education, human resource development, reading, secondary education, special education/early childhood, vocational special education, and supervision and human relations. The degree of Education Specialist is offered in administration and higher education.

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION

Dean N.M. Loeser
Associate Dean L. Gintzig
Assistant Deans J. Lobuts, Jr., P.B. Malone

FACULTY*

Professors E.B. Adams, F. Amling, M.S. Baratz *(Visiting)*, P.S. Birnbaum, G. Black, D.S. Brown, B. Burdetsky, S.R. Chitwood, K.J. Darr, M.C. Devolites, S.F. Divita, R.F. Dyer, R.B. Eastin, A. El-Ansary, R.W. Eldridge, R.F. Ericson, S.S. Fuller, M.G. Gallagher, L. Gintzig, P.D. Grub, W.C. Handorf, J. Harvey, W.J. Keegan, F.C. Kurtz, G.P. Lauter, E.J.B. Lewis, G.L. Lippitt, N.M. Loeser, A.J. Mastro, D.C. McGrath, Jr., H.R. Page, C.M. Paik, P.N. Reeves, D.D. Roman, J.B. Spain *(Visiting)*, P.B. Vaill, J. Zwick

Associate Professors W.H. Becker *(Visiting)*, J.H. Carson, B.L. Catron, J.P. Coyne, H.J. Davis, E.H. Forman, F. Ghadar, L. Graff, S. Greene, E.W. Hahn, W.E. Halal, W.W. Hardgrave, M.M. Harmon, R.L. Holland, E.L. Hullander *(Visiting)*, J. Lobuts, Jr., J.F. McCarthy, Jr., A.E. Merget, Y.S. Park, J.N. Pearce, J.M. Sachlis, S.N. Sherman, R.G. Shouldice, W.E. Smith, R.M.F. Southby, C.J. Testa, S.J. Tolchin, L.H. Truong, S. Umpleby, C.W. Washington, E.K. Winslow

Assistant Professors W.C. Adams, T.M. Barnhill, D.F. Bergwall, M.H. Bowers, W.D. Breneman, J.R. Carey, N.G. Cohen, G.E. Crum, J.D. Frame, D. Gale, W.D. Greaf *(Research)*, M.E. Hatcher *(Visiting)*, D.R. Kane, M.L. Liebrenz, S.D. Lind, L.M. Maddox, P.B. Malone III, C.P. McKelvey, D.J. Moon *(Research)*, P.S. Peyser *(Visiting)*, F.J. Rooney, D.R. Sheldon, J.B. Thurman

Instructor M.L. Slagle *(Visiting)*

Adjunct Instructors G.S. Baker, A.C. Riley, J.A. Talbot, G.B. Wright

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty of the School of Government and Business Administration.

Committees*

DEAN'S COUNCIL

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Tolchin

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G. Black, D.E. Gale, L. Gintzig, L. Graff, A.J. Mastro, A.E. Merget, R
Shouldice

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Paik, D.O. Porter, P.B. Vaill

COMMITTEE ON UNDERGRADUATE STUDIES

A.I. El-Ansary, D.R. Sheldon, J.Y. Ruth, W.E. Smith, C.P. McKelvey, P
Malone

INTRODUCTION

This School was organized as the School of Government in 1928. Durin
the next two decades, programs in business administration and public ad
ministration were added, and the emphasis gradually shifted from under
graduate to graduate study. The name was changed in 1960 to the Schoo
of Government, Business, and International Affairs to reflect more ac
curately the offerings of the School. In 1966 two schools were established–
the School of Government and Business Administration and the School o
Public and International Affairs.

Purposes

The School of Government and Business Administration is dedicated t
academic excellence through the study, teaching, and research of manage
ment and policy in the public and private sectors, both within the United
States and internationally.

Over a span of half a century, the School of Government and Business
Administration has developed a learning community in which mature in
dividuals can prepare themselves to assume membership and leadership
roles in society. The School practices a multi-disciplinary approach with
flexibility in educational programming in the belief that such is essential t
dealing with the complexities of today's organizational society. The Schoo
offers preparation of both the generalist and the specialist for professional

* The Dean of the School is an ex *officio* member of all committees.

careers, and seeks to improve the quality and character of the individual as citizen, professional, and scholar as well.

More specifically, the purposes of the School are:

1. To prepare its graduates for positions in the management of complex organizations.
2. To provide a broad and fundamental education as preparation for positions carrying management and leadership responsibilities.
3. To provide specialized educational opportunities as preparation for career positions in professional disciplines or functional areas.
4. To explore in all their forms, through education and research, the content, interactions, and interdependencies of disciplines and institutions in the public and private sectors, both nationally and internationally.
5. To make available the School's resources to business, health, government, community, and other organizations in both the metropolitan area and the larger community.
6. To foster understanding and advancement of knowledge and skills in the world community through research, education, and scholarly exchange with governments, institutions, and organizations engaged in the solution of international trade and investment problems, and the management of human settlements.

Academic Status

The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business, and the undergraduate programs are accredited by the Assembly. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and Certified Management Accountant professional examinations. The program in health services administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Urban and Regional Planning degree program is recognized by the American Planners Association. The School is a member of the National Association of Schools of Public Affairs and Administration.

Fellowships

The School of Government and Business Administration has several graduate fellowships available to its students, including the Aryamehr Research Fellowships in International Business, Health Services Administration Fellowships, Ernst and Ernst Grant to Doctoral Candidates in Business or Economics, the National Association of Purchasing Management Fellowship, the Scottish Rite Foundation Fellowships, and the Wolcott Foundation Scholarships.

REGULATIONS

Regulations concerning admission, registration, fees and finances are stated on pages 20-32; other University regulations, on pages 44-52.

Attendance

A student may not attend classes until registration is completed and fees due are paid. A student may be dropped from any course for undue absence.

The student is held responsible for all the work of the courses in which registered, and all absences must be excused by the instructor in charge before provision is made for the student to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

Withdrawal

Withdrawal from a course or from the University without academic penalty is permitted during the first five weeks after registration for the fall or spring semester. Withdrawal after this period is permitted only in unusual circumstances, and requires certification by the instructors of courses for which the student is registered that the student is doing passing work (see "Withdrawal," page 47).

Adding Courses

Courses may not be added after the first two weeks of classes in any semester.

Independent Study Plan

A student of *demonstrated capacity*, with a special interest in the subject matter of a course, may be permitted to undertake study under the personal direction of an instructor, in accordance with the rules of the appropriate department. Credit under this plan is limited to the specific course credits normally allowed when taken on a class basis.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

Students From Other Schools Within the University

Degree candidates from other schools of the University cannot register for more than 12 hours of credit in courses from the Bachelor of Business Administration or Master of Business Administration degree programs.

Common Body of Knowledge

Programs leading to the degrees of Bachelor of Business Administration and Master of Business Administration include the equivalent of at least one year of work in the following areas:

1. a background of the concepts, processes, and institutions in the production and marketing of goods and/or services and the financing of the business enterprise or other forms of organization;

2. a background of the economic and legal environment as it pertains to profit and/or nonprofit organizations, along with ethical considerations and social and political influences as they affect such organizations;
3. a basic understanding of the concepts and applications of accounting, quantitative methods, and information systems;
4. a study of organization theory, behavior, and interpersonal communications;
5. a study of administrative processes under conditions of uncertainty, including integrating analysis and policy determination of the overall management level.

THE BACHELOR OF BUSINESS ADMINISTRATION DEGREE

The School offers programs leading to the degree of Bachelor of Business Administration in the fields of accounting; business, economics, and public policy; finance; information systems technology; marketing; and personnel management.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class include:

1. An acceptable certificate of graduation from a U.S. secondary school, showing at least 15 units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college-preparatory mathematics beyond introductory algebra. An applicant whose high school record is deficient in any of these units cannot be admitted until such deficiencies are made up.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting a U.S. secondary certificate or its foreign equivalent must also show competence in the English language by scoring not less than 550 on the first taking of the TOEFL or 600 on the second taking. International students may be required to enroll in a full-time program in English before beginning studies in a degree program.

2. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test. (Normally, students with SAT verbal scores below 450 or SAT math scores below 500 will not be admitted.)

Criteria for admission include a strong high school record and a satisfactory performance on the Scholastic Aptitude Test examinations. It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 08540, or 1947 Center St., Berkeley, Calif. 94704, not less than one month

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University, are as follows:

Ordinarily, students who have accumulated (1) no more than 30 semester hours of transferable relevant academic credit must have a minimum 2.00 cumulative grade index, as well as meeting the freshman requirements; or (2) 31-60 transferable semester hours of relevant academic credit must have a 2.50 cumulative grade index or higher; students with less than 2.50 but not less than 2.00 must meet the freshman requirements; or (3) 61-90 transferable semester hours of relevant academic credit must have a 2.50 or higher cumulative grade index. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of *C* or better, and may be applied toward a degree provided they are comparable to the curricular requirements of the degree.

In no case will more than 60 semester hours of advanced standing be granted for course work completed at regionally accredited community or junior colleges. Courses taken at such colleges may be applied toward the Bachelor of Business Administration degree provided they are comparable to BAd 161 or Mgt 118. Other courses (one course per area up to a maximum of three courses), comparable to this School's courses numbered 101-200, taken at an accredited community or junior college where a grade of C or better has been earned, may be accepted to waive certain required courses. The waiver of a required course does not entitle the student to any semester hours of credit.

Although a grade of *D* is not acceptable for transfer of credit, the course may be used to waive a curricular requirement. Credits earned with a *D* grade may not, however, be counted toward the total number of semester hours required for the degree. Any course completed with a grade of *D* or better may not be repeated for the purpose of earning degree credit.*

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, Rice Hall, George Washington University, Washington, D.C. 20052.

A student wishing to transfer into the School from another division

* An exception to this rule is the freshman English composition requirement. Any student earning a grade lower than C in English composition at another institution may be required to repeat the course(s) at this University.

of this University must submit a formal application of transfer to the Office of Admissions in Rice Hall.

Courses taken at another division of this University may be applied toward a degree in this School provided they are comparable to the curricular requirements of the degree. A maximum of 90 semester hours of transfer credit may be applied toward a degree program in this School.

In no case will credit for more than 15 semester hours of undergraduate course work taken at this University in nondegree status be allowed toward meeting degree requirements in the School of Government and Business Administration.

Readmission

A student who withdraws, is suspended or is otherwise absent from the University for one semester or more must make formal application for readmission. If readmitted, the student is subject to the rules and regulations in force at the time of return. If the student has attended one or more regionally accredited colleges or universities during absence from the University, complete official transcripts must be sent to the Office of Admissions from each institution attended.

The application fee is waived for a student applying for readmission who was registered as a degree candidate at the time of last registration at the University and who has not since registered at another college or university.

REQUIREMENTS FOR THE DEGREE

Academic Work Load

A full-time student not on probation may not ordinarily take more than 15 semester hours. A student employed more than 24 hours a week, who is not on probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or higher may take up to 18 semester hours. A student employed more than 24 hours a week, whose index is 3.50 or higher, may take up to 12 semester hours.

A student who accepts employment after registration or at any time during a semester must report immediately to the Dean, so that the program may be adjusted if necessary.

Exception to these rules will require the approval of the Dean.

An undergraduate student on probation may take no more than 12 semester hours of course work.

Scholarship Requirements

A student must have the following to graduate: (1) an overall quality-point index of at least 2.00 and (2) a quality-point index in the major of at least 2.00. All courses which are acceptable for credit toward the Bachelor of Business Administration degree are to be included in the *overall quality-point index* calculation. Elective courses in or out of the School of Government and Business Administration cannot be used as substitutes for required courses in the calculation of the *major quality-point index*. Only 100-level courses are used in the *major quality-point index* calculation.

DEAN'S HONOR LIST

The names of students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours (provided that the 12 hours are taken for a grade) and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

PROBATION

A student whose quality-point index (either overall or in the major) falls below 2.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends over the period in which the student attempts another 12 semester hours of work, which may include remedial studies as prescribed.

SUSPENSION

A student whose quality-point index (either overall or in the major) is 1.50 or below, or whose index remains below 2.00 at the end of the probationary period, will be suspended. A student suspended for poor scholarship may apply for readmission after the lapse of either a fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Committee on Undergraduate Studies of conduct during absence from the University which indicates that the student will profit from readmission. A student readmitted after suspension is on probation and must maintain a current quality-point index of at least 2.50 on each 12 semester hours of work undertaken until the cumulative (or major) index is 2.00. In no case will the probationary period after readmission exceed 24 hours of study. A student suspended twice for poor scholarship will not be readmitted.

PASS/NO PASS OPTION

A junior or senior student who has a cumulative quality-point index of

2.50 or better, may, with the approval of the advisor and the dean, take one course a semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the quality-point index. No student will be allowed to take more than four pass/no pass courses. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Required courses may not be taken on the pass/no pass basis. A transfer student may not choose this option until the second semester of enrollment in the University.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Government and Business Administration. This requirement applies to students transferring within the University, as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Government and Business Administration.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree in the School of Government and Business Administration.

Earning Credit or Waiving Requirements by Examination

A student may earn credit up to a maximum of 30 semester hours or waive curricular requirements by performing satisfactorily on the following tests:

College-Level Examination Program (CLEP)—See pages 22-23 for general information on the CLEP tests. CLEP tests in Introductory Accounting, Introduction to Business, Commercial Law, and Data Processing are limited to three credits each of advanced standing. CLEP tests in college algebra/trigonometry, and more advanced courses in accounting and business administration are not accepted for advanced standing. Students enrolled in George Washington University who wish to receive credit for CLEP Subject Examinations must receive prior approval of the department.

Advanced Placement Tests—See page 22.

Achievement Tests—See pages 24.

Examinations for Waiving Curriculum Requirements—The School of Government and Business Administration does not administer waiver examinations. However, certain arts and sciences courses may be waived, and in some instances credit may be assigned, by satisfactorily passing a special departmental examination authorized and prescribed by the department or curricular advisor concerned. Requests to take the examination should be made to the curricular advisor and the required fee paid at the Office of the Cashier before the date set for the examination. See page 77 for more information.

CURRICULUM REQUIREMENTS

One hundred and twenty semester hours of course work are required for graduation. To be recommended by the Faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work, a minimum of 60 semester hours (second-group course work) in the junior and senior years selected from one of the six major field curricula offered by the School. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and with the course prerequisites. The major field must be selected at the end of the sophomore year.

Math 3, 6, and 9 may not be used for credit towards the B.B.A. degree. First-year foreign language courses may be used as freshman electives provided that the student has not previously studied the language at the secondary level.

Curriculum for the First Two Years for All Bachelor of Business Administration Students

FRESHMAN YEAR

		Semester Hours
Mathematics:	Math 31–32 or 51–52	6
Economics:	Econ 1–2	6
English:	Engl 9 or 10, 11*	6
Science:	BiSc 3–4; Chem 3–4; Geog 1, 2; Geol 1–2; or Phys 9–10	6
Elective:	Courses other than accounting, business administration or economics†	6
	Total	30

SOPHOMORE YEAR

Accounting:	Acct 51–52	6
Business Administration:	BAd 51	3
Humanities:	Art 31–32 or 71–72; Chin 3–4; Engl 51–52, 71–72, or 191–92; Fren 3–4 or 6, or 51–52; Germ 3–4 or 51–52; Ital 3–4; Mus 3, 4; Phil 45, 50, or 71; Rel 9–10, 21, 22, 23, 59, 60; Slav 3–4, 5–6, or 91–92; Span 3–4 or 6, or 51–52; or SpDr 1, 11	6
Social Sciences:	Psyc 1, 8	6
	AmCv 71–72; Anth 1–2; Hist 39–40 or 71–72; PSc 1, 2; or Soc 1, 2	6
Statistics:	Stat 51	3
	Total	30

* Engl 50 (English Composition/Research Methods for International Students) may be substituted for Engl 9 or 10, provided that a grade of C or better is received, and that the student is ready to go on to Engl 11. A student who has received credit for Engl 50 may not receive credit for Engl 9 or 10.

† Restricted to lower than 100-level courses. (Courses in human kinetics and leisure studies may not be taken for credit.)

Major in Accounting*

The principal objective of the undergraduate program in accounting is preparation for a professional career in accounting. Although professional preparation requires specialization in the acquisition of accounting knowledge in the junior and senior years, attainment of the objectives requires a general education in English, humanities, social sciences, mathematics, and sciences in the first two years of undergraduate study. In addition, a common body of knowledge in business administration is necessary during the junior and senior years, with special reference to the needs of the student in the accounting program. An additional objective is the preparation of students for a fifth-year or Master of Accounting program. This is intended to meet the academic needs of students seeking professional accounting careers in the public or private sector which currently demand high entry-level academic achievement.

JUNIOR YEAR

		Semester Hours
Acct 101:	Cost and Budgetary Control	3
Acct 121:	Intermediate Accounting	3
Acct 161:	Federal Income Taxation: Individuals	3
Acct 191:	Advanced Accounting	3
BAd 102:	Fundamentals of Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
BAd 161:	Commercial Law	3
Mgt 118:	Introduction to Information Processing	3
Engl 100:	Expository Writing in Accounting	3
	Total	30

SENIOR YEAR

Acct 132:	Accounting Theory	3
Acct 171:	Auditing	3
Acct 181:	Accounting Systems	3
BAd 101:	The Business Environment	3
BAd 198:	Business Policy and Administration	3
Mgt 119:	Computer Programming for Information Systems	3
Econ 121:	Money and Banking	3
Stat 103:	Sampling in Accounting	3
Elective:	Three semester hours selected from courses in accounting,† business administration, or economics, and three semester hours selected from courses in other departments	6
	Total	30

ACCOUNTING PRACTICE INTERNSHIP

An internship program, limited to selected senior accounting majors, is

* To be accepted in the undergraduate accounting program a cumulative grade average of 2.50 or higher is required at the start of the junior year.

† Qualified students accepted in the accounting internship program will elect Acct 199 in place of three semester hours of electives selected from courses in accounting, business administration, or economics.

available during the semester break of the senior year. To be admitted to this program students must have the approval of the chairman of the Department of Accounting and must have completed at least 15 semester hours of accounting courses, including a course in auditing, by the end of the fall semester of the senior year, with a grade average of 3.0 both in accounting and overall at the start of the fall semester of the senior year. Students will be paid a salary while conducting audits under senior supervision of participating C.P.A. firms. Other internships with industry and government are available. Students who complete the internship successfully will register for Acct 199 the spring semester of their senior year and will receive three semester hours of credit. For further information consult the chairman of the Department of Accounting.

Majors in Finance, Information Processing, Marketing, Personnel Management, and Business, Economics, and Public Policy

The programs in these five fields of instruction are designed to provide the broad foundation required for eventual leadership in either business or governmental administration. The programs consist of 36 semester hours of required general business administration courses; 15 hours of required major-related courses; and nine hours of electives, normally advanced courses in liberal arts subjects.

JUNIOR YEAR

		Semester Hours
Acct 193:	Business Budgeting	3
BAd 102:	Fundamentals of Management	3
BAd 105:	Personnel Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
Mgt 118:	Introduction to Information Processing	3
Major-Related Courses:	Six semester hours selected from the chosen area of specialization (see below)	6
Elective:	To be selected in consultation with the advisor	6
	Total	30

SENIOR YEAR

BAd 101:	The Business Environment	3
BAd 161:	Commercial Law	3
BAd 181:	Manufacturing Production	3
BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
*Psyc 144:	Personnel and Industrial Psychology or	
Mgt 107:	Fundamentals of Behavioral Science	3
Major-Related Courses:	Nine semester hours selected from the chosen area of specialization	9
Elective:	To be selected in consultation with the advisor	3
	Total	30

* Marketing majors should complete BAd 146, *Consumer Behavior*, in lieu of this requirement.

The major field should be selected at the end of the sophomore year. The student should contact the Assistant Dean for Undergraduate Programs for the assignment of a faculty advisor. Major-related courses for finance, information systems technology, marketing, personnel management, and business, economics, and public policy are described below.

1. Business, Economics, and Public Policy

This field is directed toward developing understanding and skills applicable to a wide variety of positions in business and government. Students will supplement basic course work in business and economics with additional courses in economics, political science, and government-business relations. The social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of governmental programs and regulatory activity will be studied to establish a basis for developing and evaluating effective business responses. The program is concerned with the continuing business-government dialogue on effective and equitable relations between the two sectors of the economy.

The following courses provide a basic academic foundation in the area of business, economics, and public policy:

BAd 107:	Collective Bargaining
BAd 132:	International Business Finance
BAd 176:	International Business Theory and Policy
*Econ 101:	Intermediate Microeconomic Theory
*Econ 102:	Intermediate Macroeconomic Theory
Econ 136:	Natural Resources and Environmental Economics
Econ 158:	Industrial Organization
Econ 159:	Government Regulation of the Economy
Econ 161:	Public Finance I
Econ 162:	Public Finance II
Econ 181–82:	International Economics
PSc 116:	The American Presidency
PSc 117:	Public Administration and Bureaucratic Politics
PSc 118:	Legislative Process

2. Finance

This field helps students develop the skills required for entry-level employment in corporations, financial institutions, and the public sector. Corporations employ entry-level finance specialists for cash, credit, or inventory analysis or management and for work in bank relations and capital budgeting. Financial institutions offer opportunities for entry-level finance specialists to analyze specific securities and to assist in loan analysis. The government sector looks to finance majors as potential financial analysts. The undergraduate B.B.A. degree with a finance major also provides an excellent foundation for graduate academic programs, especially the study of law.

The following courses provide a basic academic foundation in the field of finance:

*Acct 111:	Financial Statement Analysis
BAd 113:	Real Estate Investment
BAd 121:	Fundamentals of Insurance and Risk Management
BAd 132:	International Business Finance
BAd 133:	Capital Formation
BAd 134:	Working Capital Management
*BAd 138:	Investment and Portfolio Management
*BAd 139:	Advanced Financial Management

* Required for this major field.

3. Information Processing

Students taking this field are recruited by organizations in both the public and private sectors for positions as programmer/analysts and systems designers. These entry-level positions lead to careers in the marketing of computer hardware and software, systems consulting, and management. Medium to large organizations are currently expanding their reliance on computer systems and, with the development of inexpensive but powerful mini- and microcomputers, thousands of smaller organizations are finding computers to be cost-effective as well.

Students will supplement the basic skills learned in the B.B.A. curriculum with courses planned to provide a firm foundation in the use of the computer as a tool in solving information problems in organizations. These courses relate ongoing, real-world applications of computers to the functional areas of business and government organizations.

The following courses provide a basic academic foundation in the area of information processing:

†CSci 157:	Machine and Assembly Language Programming
†CSci 158:	Algorithmic Methods and High-Level Languages
*Mgt 119:	Computer Programming for Information Systems
*Mgt 120:	Information Systems Development I
*Mgt 121:	Information Systems Development II
*Mgt 122:	Special Studies in Information Systems
Phil 121:	Symbolic Logic
Stat 114:	Data Structures

4. Marketing

This field has the objectives of: (1) developing a conceptual understanding of a complex and changing environment and its effects on marketing activities and institutions; (2) understanding the dynamics of buyer behavior; (3) providing the skills to analyze demand, market segments, and cost-volume profit relationships of marketing programs; (4) enhancing abilities in written and verbal communications; and (5) developing skills in formulating and implementing comprehensive marketing plans.

Typical entry-level positions for students with marketing majors are: advertising account executives, marketing research project managers, retail assistant buyers, and sales representatives for consumer or industrial products firms. Students with marketing backgrounds also have obtained positions in physical distribution, public relations, wholesale firms, and a variety of governmental and non-profit organizations.

The following courses provide a basic academic foundation in the area of marketing:

*BAd 143:	Marketing Research
BAd 144:	International Marketing Management
*BAd 145:	Sales Management
BAd 147:	Advertising
BAd 148:	Seminar: Retailing Management
*BAd 149:	Marketing: Strategic Planning
BAd 171:	Transportation and Logistics Management
BAd 175:	Introduction to International Business
Jour 145:	Principles and Problems of Public Relations
Stat 105:	Statistics in the Behavioral Sciences
Mgt 119:	Computer Programming for Information Systems

* Required for this major field.
† See the School of Engineering and Applied Science *Bulletin*.

5. Personnel Management

This field is concerned with all aspects of the employment of human resources in business organizations. Entry-level career opportunities are in such fields as personnel management, employee relations, collective bargaining, and manpower utilization. Since the field focuses on the management of human resources in a general sense, this concentration also prepares the student for responsibilities associated with general management and leadership.

The following courses provide a basic academic foundation in the area of personnel management:

*BAd 106:	Leadership in Personnel Management
*BAd 107:	Collective Bargaining
Jour 145:	Principles and Problems of Public Relations
Psyc 129:	Theories of Personality
Psyc 131:	Psychological Tests
SpDr 121:	Group Discussion and Conference Leadership

THE MASTER'S DEGREES

ENTRANCE REQUIREMENTS

To be considered for admission applicants must present the following minimum credentials: a bachelor's degree from a regionally accredited college or university, including at least 90 semester hours of academic work with an overall quality-point index of 2.50 (on a 4.00 scale) and a score of at least the 50th percentile on the applicable admission test.

Applicants whose undergraduate quality-point index is less than 2.50 or whose admission test score ranks beneath the 50th percentile may be considered if (1) the quality-point index multiplied by 200 and added to the admission test score equals 950 points, or (2) the upper division undergraduate (last two years of undergraduate work) quality-point index multiplied by 200 and added to the admissions test score equals 1,000 points.

Applicants for admission to programs leading to the degrees of Master of Accounting and Master of Business Administration must submit acceptable scores on the Graduate Management Admission Test; applicants for admission to programs leading to the degrees of Master of Health Services Administration and Master of Urban and Regional Planning must submit scores on the Graduate Management Admission Test, the Miller Analogies Test, or the Graduate Record Examination; applicants for admission to programs leading to the degrees of Master of Public Administration and Master of Science in Information Systems Technology must submit scores on the Graduate Record Examination. It is the responsibility of the applicant to make arrangements for the required test with the Educational Testing Service, Princeton, N.J. 08540. Correspondence concerning the Graduate Management Admission Test should be addressed to Box 966; concerning the Graduate Record Examination, to Box 955.

GENERAL REQUIREMENTS

All students must complete the prescribed minimum number of semester hours of graduate course work. A maximum of one-quarter of the semester

* Required for this major field.

hours of graduate course work required for a degree may be approved for transfer to the School of Government and Business Administration from the Division of University and Summer Students, another degree-granting division of this University, or another accredited college or university under the following conditions: the course work must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be at the graduate level, it must have been taken within the past two years, and the student must have received a grade of *B* or better. This action must be approved by a petition to the advisor and the dean. A transcript of the course work must be on file before the petition can be considered.

Extended programs, including undergraduate background courses, may be assigned for an applicant whose undergraduate degree was in a field other than the graduate program the student wishes to follow, or whose undergraduate record indicates a weakness in required background courses.

Master's degrees are awarded by vote of the Faculty on completion of the required course work, an acceptable thesis (if one is elected or required) or the equivalent work, and the passing of the Master's Comprehensive Examination if required in the chosen degree or concentration.

Second-group courses (numbered 101-200) may be counted toward the master's degree only when registration for graduate credit has been approved at the time of registration by the dean and the curriculum advisor. No work counted toward a bachelor's degree may be counted toward a master's degree.

Full-time students are normally expected to register for nine to 12 semester hours each semester. A graduate student who is employed more than 20 hours a week may not take more than six semester hours. All work for a master's degree *must be completed in five years, unless* an extension of time is granted by the dean.

Students who expect to continue studies for the degree of Doctor of Business Administration or Doctor of Public Administration after receiving the master's degree should ask for assistance in planning programs so that they may qualify for admission to candidacy for the doctorate.

No credit is granted for work done *in absentia* or without formal instruction, except for hospital residency, supervised field experience and the thesis, which may be completed *in absentia* with the permission of the department, curriculum advisor or committee concerned.

MASTER'S COMPREHENSIVE EXAMINATION

Written Master's Comprehensive Examinations are required only in certain degrees and fields of instruction. Degree candidates should consult faculty advisors about examinations required and material to be covered. In writing the examinations students are expected to correlate what has been learned in course work and from the literature of the field. The examinations normally require four to eight hours. Sections broadly cover the various fields which the candidate has selected.

Examinations are generally scheduled in the fall and spring semesters and should be taken during the last semester of course registration or shortly after completion of prescribed course work.

A written application is filed with the department supervising the student's field of study at the time of registration for the semester in which

the examination is to be taken. Before applying, the student must have completed all courses in the program or be enrolled in the last semester and must have achieved a 3.00 (*B*) average. After applying for the examination, a candidate may withdraw only by written notice to the department chairman.

A candidate who fails the examination should consult with the faculty advisor as to a subsequent course of action.

SCHOLARSHIP REQUIREMENTS

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *CR*, Credit; *W*, Authorized Withdrawal; and Z, Failure, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of C is not considered as failing but must be balanced by a grade of *A* in a graduate course of equal status. A minimum grade-point average of 3.00 is required for award of a graduate degree. All courses taken after matriculation as a graduate student (except for *Audit* or *CR*) will be used in the calculation of the grade-point average.

A student whose quality-point index falls below 3.00 will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of work, including prescribed courses. During this period the student's performance will be monitored to determine suitability for continued study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause, for consideration by the dean, as to why continued study should be permitted.

A master's degree candidate given the grade of *F* in a required course, and permitted to continue in graduate studies, must repeat the course and achieve at least the grade of *B*. (Such a retake does not expunge the grade of *F* and it remains part of the student's record.) Should this level of performance not be obtained, the student will be denied further registration as a degree candidate.

SUSPENSION

A graduate student who does not meet the conditions of probation (see above) will be suspended or asked to withdraw. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence which indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index a second suspension will result and subsequent readmission will be denied.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances an instructor and a student may jointly petition the Dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

The Thesis

Students contemplating doctoral study are strongly urged to include the thesis as an elective in their master's program. The thesis subject should be selected as early as possible so as to permit effective integration with the course work.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the Dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the two semesters in which registered for thesis (299–300), to the advice and direction of the member of the Faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time is granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis 300, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER OF ACCOUNTING

The Master of Accounting degree is designed to prepare students for professional careers in accounting. Although accounting careers may be in the public or private sector, a particular objective of the program is the student's attainment of professional certification. The Master of Accounting is recognized as the necessary fifth year of education in a professional accounting program, and as such, it is superimposed on a Common Body of Knowledge in accounting and business subjects. The Common Body of Knowledge is ordinarily attained by the completion of a bachelor's degree in accounting or business from an accredited institution of higher education. A minimum of 30 semester hours of graduate course work will be required of all students who have completed the prerequisite courses prior to admission to the program (see page 196). Specific prerequisite courses required in accounting and business will vary, based on the student's status upon admission to the program. Successful completion of a comprehensive examination in the final semester of course work is required.

MASTER OF BUSINESS ADMINISTRATION

The Master of Business Administration degree is recognized as the best preparation for careers in management. The program of study leading to

the Master of Business Administration provides a basic foundation in the functions of business, the environment in which it operates, and the analytical tools needed for intelligent decision-making. The program of study provides depth of understanding in one field of concentration and a broad exposure to subjects and issues at the general management level.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed prior to admission. Thus, the minimal program is at least 33 semester hours.

The program of study consists of two levels:

First Level:

*Common Body of Knowledge Courses (30 hours)**
Econ 217–18; Acct 201; Mgt 200, 218, 270; BAd 201, 230, 240, 297

This set of courses must be completed prior to enrollment in Second-Level courses, except for BAd 297 which should be taken in the last semester of the program. All of these course requirements, except BAd 297, may be satisfied by evidence of successful completion of comparable work at other institutions. Common Body of Knowledge courses not completed before the applicant matriculates in the School of Government and Business Administration will be assigned in the letter of admission.

Second Level:

1. *Breadth Courses (15 hours)*
This set of courses provides exposure to a broad range of subjects intended to develop general competence in overall management. In consultation with the advisor, the student selects five courses from at least four areas outside the area of concentration. Thus the student has the flexibility to design a program that is tailored to individual career goals.

2. *Field of Instruction Courses (12 hours)*
The purpose of this set of courses is to give the student an understanding in a selected field. Courses are selected in consultation with the advisor and may be tailored to individual interests.

3. *Elective (3 hours)*
The student may select any graduate-level course to satisfy this requirement in consultation with and with the approval of the advisor.

Fields of Instruction

Students select a minimum of 12 semester hours from one of the following fields.

BUSINESS, ECONOMICS, AND PUBLIC POLICY

This field is directed toward understanding, analyzing, and dealing with the principal forces shaping the total business environment. Special attention is paid to the policies and programs of governments, social and cultural change, and the structure, evolution, and fluctuations of the

* First-Level courses may not be taken to satisfy Second-Level requirements (breadth, area of concentration, or elective).

economy. Students concentrating in this area take courses that survey the social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of government programs and of business response to these programs. Elective courses may be chosen in business representation, public decision-making, government regulation of business, government-business liaison functions, and public administration.

FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range planning, reporting and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than a form of substantive difference.

GENERAL MANAGEMENT SYSTEMS AND ORGANIZATIONAL CYBERNETICS

This field addresses the critical need for management to deal effectively with the fact that human institutions of all kinds tend to become larger and more complex as changes accelerate both socially and technologically. In many traditional academic fields general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This has profound relevance for the contemporary operating manager and policy-maker.

Because this program is essentially interdisciplinary and transcontextual in nature, the student is afforded an unusually broad range of opportunities to apply educational experience to managerial, organizational and societal problems. Professional and academic career potentials are available in the following fields: (1) research and teaching in the growing number of systems and cybernetics oriented programs now emerging in colleges and universities in the United States and elsewhere in the world; (2) institutional/environmental interface management or consulting; (3) system-focused organization development consulting or staff work; (4) corporate and government agency long-range (strategic) planning and control activities; and (5) advisory and staff positions and program directors in global agencies such as operating components of the United Nations, multinational corporations and foundations, and multi-governmental agencies such as OECD, as well as in the agencies and departments of national governments.

HUMAN SYSTEMS

This field of study reflects the assumption that the effective utilization of the behavioral sciences is concerned with both means and ends; that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the student with organizational concepts and behavioral

skills appropriate to optimizing the utilization of a human system's total resources.

This program helps to meet the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem-solving, organizational growth, and increased complexity of modern organizations and their effect upon the functions of organizational development.

INFORMATION SYSTEMS MANAGEMENT

This field is designed to provide a managerial understanding of the principles of manual, mechanical, and electronic information processing, including computer programming concepts, methods, and languages; an appreciation of the capabilities, limitations, and selection procedure of information processing equipment; a knowledge of all phases of management information systems development, implementation, and evaluation; and an understanding of the roles of both management and systems personnel in information technology. It also provides an appreciation of the role of information systems as a tool of management.

Students participate in the development of management information systems; in the selection of computer equipment; and in the installation, management, and evaluation of management information systems—during class sessions.

INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in firms operating on a multinational basis or about to enter the international field; for careers in the federal government and in international agencies concerned with business, industry and finance abroad; and for the commerce option of the Foreign Service Officer Examination.

This program is also designed to provide foreign students with the background and skills necessary to promote international business, and to prepare them for careers in foreign and domestic firms within their own countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's advisor according to the student's background and interests.

MANAGEMENT OF SCIENCE, TECHNOLOGY, AND INNOVATION

This field explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of "state-of-the-art" technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

MANAGERIAL ACCOUNTING

This field provides a contemporary, broadly based academic preparation for the field of general administration in which the manager employs accounting as a means of understanding the organization.

MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are *Marketing Management, Buyer Behavior,* and *Marketing Research.* Functional courses are *Promotion Management, Marketing Channels, Marketing Strategy,* and *Product/Service Management.* Specialized elective courses, *International Marketing, Industrial and Government Marketing,* and *Marketing and Public Policy,* utilize the resources of the Washington metropolitan area.

PERSONNEL MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions and local, state and federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations and manpower utilization.

PROCUREMENT AND CONTRACTING

This field responds to a demand for greater professionalism imposed by the increasingly diverse goods and services created by our modern economy. As this diversity grows, organizations find the most efficient, and often the only, method of meeting needs is through procurement action. A sustained growth in purchase volume, variety, and complexity has occurred in both public and private sectors. This growth places ever greater demands upon the skill and resourcefulness of procurement and contracting personnel. The field has therefore been designed with the following objectives: (1) to provide a broad professional education in the knowledge and skills necessary for success in this field; (2) to help the student develop increased ability in analysis, decision-making, and communications; (3) to enhance the student's understanding of the economic, social, legal, and technological considerations present in procurement and contracting activity.

QUANTITATIVE ANALYSIS FOR DECISION-MAKING

This field develops a thorough understanding of quantitative or mathematical approaches to problems of managerial control and decision-making.

While the program will develop a competent background in basic mathematical theory associated with the various techniques, it is oriented toward applications of the techniques rather than their theoretical mathematical content.

MASTER OF HEALTH SERVICES ADMINISTRATION

The program of graduate study in health services administration is designed to prepare individuals for professional careers in managing and planning health services and in developing health-related policies. These careers may be in the public or private sector and may be at the local, state, national, or international level.

The curriculum for the degree of Master of Health Services Administration has two areas of concentration; however, students are encouraged to develop versatility and a broad perspective by taking a common core of courses and by taking at least one advanced course from each area of concentration. The health services management concentration stresses administration of health service delivery (e.g., administration of hospitals, and mental health and long-term care facilities). Health services policy and planning emphasizes planning health services and policy-making related to health. Departmental elective courses include such topics as advanced financial management, issues in aging, and comparative health systems. Students may also choose nondepartmental courses as electives and for their area of specialization, but advisor approval is required.

Courses required for both concentrations are: HSA 202, 203, 207, 208, 209, 210, 212, 215, 245; Mgt 210.

Additional courses required for the health services management concentration are: two courses from the services management group, one course from the policy/planning group, one elective, and three semesters of full-time field experience.

Additional courses required for the health policy and planning concentration are: two courses from the policy/planning group, one course from the services management group, three courses in an area of specialization selected by the student with advisor approval, and one semester of part-time field experience. (A research project may be substituted for the last requirement by part-time students who are employed at a professional [managerial] level in a health services organization or agency.)

Services Management Group—HSA 231, 233, 236, 237, 238, 239.

Policy and Planning Group—HSA 221, 223, 225, 227.

Three semester hours each of undergraduate accounting, economics, and statistics are prerequisite; prerequisites which have not been completed prior to admission will be taken as part of the first semester's course work. Introductory health services administration courses for beginning students are taught only in the third summer session beginning in mid-July. Beginning students may register for earlier summer sessions for the purpose of taking prerequisites not previously completed. Each student's program is planned with an assigned faculty advisor to assure that sequencing and choices of electives and courses in the concentration groups are consistent with individual career objectives.

MASTER OF PUBLIC ADMINISTRATION

The Master of Public Administration (MPA) degree program prepares the student for a professional career in public service. The 42-hour program outlined below, is intended to provide both a generic core for all students and specialized elective fields tailored to the interests and career objectives of each individual student. The curriculum provides graduate instruction in all areas recommended by the Guidelines and Standards for Professional Master's Degree Programs issued by the National Association of Schools of Public Affairs and Administration.

All students are required to complete an eight-course (24-semester-hour) core, which includes courses in public administration and management, public expenditure analysis, public policy, organization theory, human behavior in organizations, and research methods; at the end of the program, students are required to take PAd 289 which serves to integrate the diverse perspectives in public administration.

Each student selects, in addition, an elective field designed to provide him or her with deeper and broader knowledge in a field of particular interest. The elective fields generally require a four-course sequence. The program is sufficiently flexible that, with the approval of a faculty advisor, the student may design a special field when none of the fields offered matches individual learning and career objectives.

Students who lack substantial knowledge of the structure and functioning of government are strongly encouraged to take one of two courses in American administrative institutions: PAd 213 *Administration in the Federal Government* or PAd 242 *Administration of State and Local Governments*. The remainder of the program consists of two elective courses chosen by the student with the advisor's approval. The electives may be taken in any related program or discipline.

Because the public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no specific course prerequisites.

Required Courses

PUBLIC ADMINISTRATION REQUIRED CORE (24 hours)

1. PAd 205 Introduction to Public Administration and Management
2. PAd 295 Research Methods
3. PAd 296 Statistical Applications in Public Administration
4. PAd 261 Policy Analysis in Public Administration or
   PAd 260 Policy Formulation and Administration
5. Mgt 210 Individual and Group Dynamics in Organizations
6. PAd 221 Organization Theory and the Public Sector or
   PAd 223 Behavioral Factors in Large and Complex Organizations
7. PAd 252 Public Expenditure Analysis and Planning
8. PAd 289 Public Program Management and Policy Implementation

ELECTIVE FIELDS (12 hours) (See page 159)

AMERICAN ADMINISTRATIVE INSTITUTIONS (3 hours)

Either PAd 213, Administration in the Federal Government, or PAd 242, Administration of State and Local Governments, is recommended as an introductory course. Either course may be counted as 3 of the 12 hours required in the elective field.

ELECTIVE COURSES Two courses (6 hours)

Elective Fields*

The six elective fields offered within the Department of Public Administration are described below. Other SGBA fields are described elsewhere. Twelve hours are required for each field.

BUDGET AND PUBLIC FINANCE

This field covers the processes and institutions involved in budgeting, including the practical requirements of financial management; addresses issues of intergovernmental finance in a Federal system; and imparts knowledge of alternative methods for allocating scarce public resources. The field is most directly suited to those who are or envision becoming budget analysts or financial management officers in public agencies.

GOVERNMENTAL ADMINISTRATION

This field offers the student a broad understanding of some of the major functions critical to effective public management, including personnel, budgeting, and the law. For those entering the MPA program directly from an undergraduate program, this field provides insight into several potential areas for future specialization, employment, or research. For mid-career public officials, this field provides the opportunity to explore more systematically and analytically the governmental functions they have observed in practice.

ORGANIZATION AND MANAGEMENT

This field gives primary attention to the processes by which organizations are structured and their work undertaken. It includes courses in organizational theory, but is also concerned with the management of governmental programs. It is for students who envision careers in administering public sector programs.

POLICY ANALYSIS AND EVALUATION

The policy field is designed for those who wish to focus on the processes of public decision-making, and to develop abilities to analyze and evaluate those processes. This field is most directly appropriate for those who now hold or anticipate taking staff analyst positions in government agencies, or similar positions in research or consulting firms.

PUBLIC PERSONNEL ADMINISTRATION AND MANPOWER

This field addresses the traditional concerns in public administration with personnel, the staffing function of public organizations, and labor relations in the public sector. Courses are also offered in manpower development and the use of human resources. Graduates concentrating

* Students may also elect such other standard four-course SGBA fields as: Business, Economic, and Public Policy; Human Systems; Information Systems Technology; International Business; and Quantitative Analysis for Decision-making. Students may also take an approved four-course sequence in the Department of Health Services Administration or the Department of Urban and Regional Planning. Moreover, a special field may be constructed, tailored to the student's academic interests and career objectives. To take a special field, the student writes a brief justification specifying the courses to be taken, and submits it by petition through the faculty advisor.

in this field typically work in personnel administration at some level of government.

URBAN ADMINISTRATION

This field is designed for students interested in pursuing careers in state and local government administration. Students learn to deal with a range of Federal, state, and local problems and issues, including alternative governmental structures and assignments of functions, sources of revenues and expenditure patterns, intergovernmental relations and management concerns, local government financing, and the formulation and analysis of urban policies.

Internships

Students with little or no professional experience are strongly encouraged to take an internship during the MPA program. There are many opportunities in the Washington area for intern experiences in Federal agencies, in county and city government agencies, and in the quasi-public sector. The Department assists students in securing appropriate internships; students are also encouraged to find internships on their own initiative. A substantial effort is made to relate the intern experience to the student's academic program. Internships may be paid or unpaid, and taken for credit or not for credit. To receive academic credit, students must have completed nine credit hours in the degree program. In general, internships for credit involve 15-20 hours of work per week for 14 weeks.

MASTER OF SCIENCE IN INFORMATION SYSTEMS TECHNOLOGY

The Master of Science in Information Systems Technology provides preparation for a career in the application of computers to the data and information problems found in organizations today. The program emphasizes a practical understanding of contemporary design and implementation approaches utilized in the development of computer-based systems.

Degree Requirements

1. Twenty-one semester hours of prerequisite courses or equivalents as follows: Mgt 118, 119, 120, 121, 122; Math 31 and 32, or 51 and 52.
2. Completion of 30 semester hours of graduate course work with a QPI of 3.0, including the following courses plus 6 semester hours of electives: Mgt 241, 244, 245, 246, 247, 248, 250, 251.
3. Successful completion of a comprehensive examination.

MASTER OF URBAN AND REGIONAL PLANNING

The program of graduate study in Urban and Regional Planning leads to the professional planning degree of Master of Urban and Regional Planning. It is designed as preparation for careers on the municipal, county, state, and national levels, and for private practice. The course of study is designed to provide a broad education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Each stu-

dent's program is designed in consultation with an assigned faculty advisor in accordance with individual career plans.

The degree is awarded by vote of the Faculty after satisfactory completion of (1) from 45 to 50 semester hours of course work, depending upon the background and experience of each individual student, including a thesis equivalent to six semester hours (most students will ordinarily be required to take 50 semester hours); (2) a minimum of three months' full-time professional training in a planning agency under qualified supervision, with an acceptable written report to be submitted after completion of the training period; (3) a written Master's Comprehensive Examination; and (4) a thesis based on the candidate's research in the field of urban and regional planning.

POST-MASTER'S GRADUATE CERTIFICATE IN HEALTH SERVICES ADMINISTRATION

Students with approved master's degrees from accredited institutions may take a special post-master's program leading to a Post-master's Graduate Certificate in Health Services Administration. Each program will be planned to meet the professional needs of the individual student, whether the student wishes to undertake a new field of study or to amplify knowledge of work done at the master's level.

DOCTORAL PROGRAMS

Study for the degree of Doctor of Business Administration (D.B.A.) and Doctor of Public Administration (D.P.A.) is supervised by the Committee on Doctoral Studies.

Admission

The minimum admission requirement is a bachelor's degree, preferably with a major appropriate to the proposed field of study. Applicants whose degrees are in fields other than business or public administration are expected to obtain the necessary background either before or soon after admission to the program. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances, scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are encouraged, but not required, to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Arrangements to take these tests must be made with the Educational Testing Service. Students whose native tongue is not English must also submit the Test of English as a Foreign Language (TOEFL) scores (see page 26).

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

This evaluation takes three to four weeks, after which the Admissions Office notifies each applicant, through the mail, of the Committee's decision. Completed applications must be sent to the Office of the Ad-

missions Officer, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the fall semester and summer sessions, and by October 1 for the spring semester. Graduates of non-U.S. universities must apply by February 1 for the fall semester and summer sessions, and by September 1 for the spring semester.

Plan of Study

The doctoral programs in both Business Administration and Public Administration consist of two major parts: the pre-dissertation stage and the dissertation stage. The objective of the pre-dissertation stage is to provide the student with the theoretical foundations and practices of the major and supporting fields of study and with a command of the relevant qualitative or quantitative analytical methods. The objective of the dissertation stage is to have the student apply the obtained theoretical and practical knowledge and analytical methods to the resolution of a research problem. The research should be original and is expected to result in a contribution to the existing body of knowledge on business administration or public administration. Such a contribution can be either applied or theoretical. The total program must be finished in seven years; extensions beyond this time limit can be given by the Committee on Doctoral Studies only under very special circumstances.

The pre-dissertation stage is based on an individual study plan developed by the student under the guidance of a major and supporting field advisor during the first academic year. In the study plan the student must state long-range professional objectives, all proposed academic activities, methods of evaluation, and a semester-by-semester schedule.

All students, regardless of the degree they seek and of the major field of study, must include in their Study Plan Mgt 390, *Philosophical Foundations of Administrative Research,* and the multidepartmental course, 311-312, *Seminar: Public-Private Sector Institutions and Relationships.* These courses should be taken during the first academic year after admission.

In addition to the evaluation methods proposed in the study plan, the major and supporting field advisors are expected to evaluate the student's progress at the end of the first and second semesters after admission, and thereafter before the end of the spring semester of each academic year.

Major and supporting fields of study include:

Accounting
Business, Economics, and Public Policy
Finance and Investment
General Management Systems and Organizational Cybernetics
Health Services Administration
Human Systems
Information Systems Technology
International Business
Management of Science and Technology
Marketing
Materials and Operations Management
Personnel Management
Public Administration
Quantitative Analysis for Decision-Making
Urban and Regional Planning*

A student seeking a D.P.A. degree is required to take public administration at least as a supporting field, to include in the study plan three doc-

* Can be selected only as a supporting field.

toral-level courses in public administration, and to engage in activities as specified by the field advisor.

A student admitted to the doctoral program with accounting as a major may be considered for a concurrent appointment as an adjunct instructor. Criteria for selection include a Master's degree and a C.P.A. See the department chairman for details.

While the major field of study must be selected from the above list, supporting fields can be chosen from other departments of the University. A student selecting a field outside of the School, however, must meet the academic and administrative requirements of the department involved.

For more detailed information on the program and its administration, see the *Handbook of the Doctoral Programs in Business Administration and Public Administration*, available in the Doctoral Programs Office.

SPECIAL PROGRAMS

Government Intern Scholarship Program

The Government Intern Scholarship Program offers annually 50 scholarships to assist government agencies in training carefully selected young men and women for administrative leadership in government career service. Each scholarship provides full tuition for two three-hour courses in one semester, and interns who maintain satisfactory standing in both their academic program and their government training program may qualify for a second scholarship for an additional semester.

Continuing Education in Health Services Administration

A nondegree program is conducted, both on campus and off campus, in the various areas of health services administration whenever a sufficiently large class is organized. Institutes, workshops, and lecture series are conducted under the auspices of program faculty and selected leaders from local, state, and regional areas on topics of current interest to the requesting organization. There is no specific prerequisite. Fees are to be announced.

International Institute for Health Services Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Services Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.

It is also equipped to enter into arrangements with principals of hospital systems in world-wide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

Combined Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's degree in some fields in the School of Government and Business Administration. Students must be admitted both to the

National Law Center and, separately, to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Certification of Purchasing Managers

The School of Government and Business Administration participates in the three nationally recognized certification programs.

Certified Public Purchasing Officer (CPPO)
Administered by:
National Institute of Governmental Purchasing
1001 Connecticut Avenue, N.W.
Washington, D.C. 20036

Certified Professional Contracts Manager (CPCM)
Administered by:
National Contract Management Association
Crystal Plaza #1, Suite 808
2001 Jefferson Davis Highway
Arlington, Virginia 22202

Certified Purchasing Manager (CPM)
Administered by:
National Association of Purchasing Management
11 Park Place
New York, New York 10007

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* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty of the School of Public and International Affairs.

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NTRODUCTION

With the establishment in 1898 of the School of Comparative Jurisprudence nd Diplomacy, the study of government was first organized as a separate ntity in the University. In 1928, this School was reorganized and roadened as the School of Government. During the next two decades,

*The Dean of the School is an *ex officio* member of all committees.

programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School. A division of the School was effected in 1966, and two schools were established—the School of Government and Business Administration, a primarily professionally oriented school, and the School of Public and International Affairs, a primarily policy-oriented school.

Programs of the School of Public and International Affairs are interdisciplinary, and emphasize both domestic and foreign governmental policy.

Students in the freshman and sophomore years are registered in Columbian College of Arts and Sciences, the liberal arts college of the University, and are assigned special advisors from the School of Public and International Affairs to assist them in planning their programs.

Academic Programs

The School of Public and International Affairs offers undergraduate programs in Chinese Language and Literature, East Asian Studies (China or Japan), and Urban Affairs; undergraduate and graduate programs in International Affairs, Middle Eastern Studies, and Public Affairs; and graduate programs in East Asian Studies, Latin American Studies, Russian and East European Studies, Security Policy Studies, and Science, Technology and Public Policy. Special programs in Soviet, Far Eastern, and East European Studies are offered by the School's Institute for Sino-Soviet Studies.

Objectives

Five undergraduate programs of study—East Asian Studies, Middle Eastern Studies, International Affairs, Public Affairs, and Urban Affairs—are aimed at preparing the student to understand major contemporary issues in international affairs or in domestic public affairs. The programs are designed not to produce narrow professional specialists, but to foster a liberal education, interdisciplinary in nature and broader than a concentration in one of the conventional disciplines. In each program there is double effort: to develop a background as broad and as deep as possible in order to assist the understanding and analysis of modern problems and to give instruction in some useful tools of analysis. The program in Chinese Language and Literature is closer to the traditional liberal arts pattern, emphasizing language and culture.

The graduate programs leading to the degree of Master of Arts are more concentrated. The student is expected to develop a greater competence in an area or a discipline, building on the student's undergraduate program in preparation for professional employment in government, in international organizations, in business, or in private agencies concerned with public or international affairs.

REGULATIONS

Regulations concerning admission, registration, fees, and finances are stated on pages 20-32; other University regulations, on pages 44-52.

Attendance

Students may not attend classes until registration is completed and fees due are paid.

Students are held responsible for all the work of the courses in which registered, and all absences must be excused by the instructor before provision is made to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

Withdrawal

Withdrawal after the end of the fifth week of classes (fall or spring semester) without academic penalty is permitted only in exceptional cases (see "Withdrawal," page 47).

THE DEGREE OF BACHELOR OF ARTS

The School offers programs leading to the degree of Bachelor of Arts in the fields of Chinese Language and Literature, East Asian Studies (China or Japan), Middle Eastern Studies, International Affairs, Public Affairs, and Urban Affairs.

ENTRANCE REQUIREMENTS

The satisfactory completion of the Chinese Language and Literature, East Asian Studies, International Affairs, Public Affairs or Urban Affairs curriculum in Columbian College of Arts and Sciences (see pages 78-80), or the equivalent, is required.

GENERAL REQUIREMENTS FOR THE DEGREE

The following requirements apply to both the standard 120-semester-hour and the special 90-semester-hour programs. See page 170 for additional requirements for the 90-semester-hour program.

Academic Work Load

Normal academic work load for the full-time student is 15 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the dean.

Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in human kinetics and leisure studies cannot be included in the required hours); and (2) grades of *A* or *B* in four three-semester-hour courses in the major, to be taken in residence at George Washington University. The major includes the required second-group courses (101-200) and courses taken in the group options.

DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index* in course work is placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

The rules below govern probation and suspension and are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester or the three summer sessions. For students taking less than 12 semester hours in any one semester or summer session, these rules are applied on the basis of 12 or more hours taken during two or more semesters or summer sessions.

PROBATION

Students who in one semester receive two grades of *F*† in courses carrying three or more semester hours of credit each, or the equivalent, are placed on probation. Those on probation who receive one grade of *F* in such a course will be continued on probation for a second semester. Those on probation taking 12 or more semester hours whose grades are all *C* or better are removed from probation.

SUSPENSION

The following three cases constitute grounds for suspension: (1) three grades of *F*† in courses carrying three or more semester hours of credit or the equivalent; (2) two grades of *F* when on probation; (3) one grade of *F* when in a second semester of probation.

Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. Students readmitted after suspension are on probation. Those who are still on probation after completing 24 credit hours, will be suspended. A student suspended twice for poor scholarship will not be readmitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester im-

* See page 46 for explanation of the quality-point index.

† In determining whether a student is placed on probation or suspension, two grades of *D* are equated with one grade of *F*. Thus, for example, a student who receives one grade of *F* and two grades of *D* is placed on probation, and a student who receives two grades of *F* and two grades of *D* is suspended.

mediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Public and International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Public and International Affairs.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.

Study Abroad

Students wishing to study abroad must consult with their advisors and the dean, because arrangements must be made on an individual basis. Students should receive the dean's approval, in advance, for their plan of study abroad if they plan to have the credits earned abroad apply to the degree program in which they are registered. A catalogue or other description of the foreign institution or study program should be presented for consideration together with detailed descriptions of the courses to be taken. Students of international affairs are encouraged to travel and study abroad.

Pass/No Pass Option

A student in the School of Public and International Affairs who has a cumulative quality-point index* of 2.5 or better may, with the approval of the advisor and the dean, take one course each semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of *P* or *NP* is normally assigned) may not be taken on a pass/no pass basis. A transfer student may not elect to take a course on a pass/no pass basis until the second

* See page 46 for explanation of the quality-point index.

semester of enrollment in the University. Students in the School o Public and International Affairs may take no more than six courses i which the grade of *P* or *NP* is assigned, including those in which th grade of *P* or *NP* is normally given and those taken in any other college school, or division of the University prior to transferring to the Schoo of Public and International Affairs.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree.

Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomore in Columbian College of Arts and Sciences, petition the dean of the Schoo of Public and International Affairs for admission to a special 90-semester-hour degree program in the School of Public and International Affairs. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the School of Public and International Affairs at the beginning of the junior year.

In addition to the general and curriculum requirements, students in the 90-semester-hour program must fulfill the following requirements:

1. The student must receive grades of *A* in 50 percent of the total course work, and also in 50 percent of the courses required in the major.
2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).
3. The 90 semester hours of credit must be earned in actual course work, i.e., credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101-200) as soon as they are qualified to do so, and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

CURRICULUM REQUIREMENTS

To be recommended by the faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work (see pages 78-80), a minimum of 60 semester hours during the junior and senior years, as set forth in one of the following curricula.

Earning Credit or Waiving Requirements by Examination

For information on earning credit or waiving curriculum requirements, see Columbian College of Arts and Sciences, page 77.

Degree Programs

Requirements for the six programs of study leading to the degree

Bachelor of Arts are listed below. Students should consult the appropriate department in the "Courses of Instruction" section of this *Bulletin* for complete course descriptions.

CHINESE LANGUAGE AND LITERATURE

Prerequisite—A minimum of 60 semester hours in Columbian College (see pages 78–79) or the equivalent from another accredited institution.

Requirements for the Major—Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Students in the Chinese language and literature program may study abroad in the junior year.

EAST ASIAN STUDIES (China or Japan)

The major in East Asian Studies is designed to introduce the student to a non-Western culture and to provide an understanding of the history, politics, and economy of modern China or Japan. The major is interdepartmental and is recommended for students who wish a comprehensive study of one of the world's major civilizations and for those who contemplate graduate study in Chinese, Japanese, or Far Eastern affairs.

A junior year abroad is available in this program of study for those interested in China. Students should contact the chairman of the Department of East Asian Languages and Literatures.

Prerequisite—The East Asian Studies curriculum, page 79, including Chin 5–6 or Japn 3–4.

Requirements for the Major—(1) Chin 11 (China focus) or minimum of three additional hours of Japanese (Japan focus), and Chin 163 or 164; (2) Econ 169 (China focus) or 170 (Japan focus); (3) three semester hours selected from Geog 125, 126, 127, 132, 146, or 164; (4) nine hours selected from Hist 137, 187, 188, 189, 195, 196 (either Hist 187 or 196, but not both, may be selected); selection covering both pre-modern and modern periods encouraged; (5) PSc 170 or 173; (6) nine semester hours of course work in economics, history, or political science not *related* to China or Japan, to be selected in consultation with and approved by the advisor; six semester hours in research and writing seminar related to China or Japan and taken in discipline of concentration.

MIDDLE EASTERN STUDIES

The major in Middle Eastern Studies introduces the student to this region through interdepartmental studies.

Prerequisite—The Middle Eastern Studies curriculum, page 79.

Requirements for the Major—(1) six semester hours of a third year of a modern foreign language; (2) three hours of either religion, art, philosophy, or literature of the Middle East; (3) three semester hours selected from Geog 125, 126, 127, 132, 145, or 146; (4) six semester hours selected from Hist 107, 108, 109, 110, 158, 193, or 194; (5) six semester hours selected from PSc 177, 178, 179, or 180; (6) nine semester hours of course work in economics, history, or political science not related to the Middle East, to be selected in consultation with and approved by the advisor; six semester hours of research and writing seminar related to the Middle East and taken in the discipline of concentration.

INTERNATIONAL AFFAIRS

The major in International Affairs enables the student to specialize in international political relations, international economics, international communications, or regional studies.

Prerequisite—The International Affairs curriculum, page 79.

Requirements for the Major—(1) Econ 181–82; (2) six semester hours of a third year of foreign language (may be literature courses taught in the language); (3) three semester hours selected from Geog 125, 126, 127, 132, 135, 145, 146, or 161; (4) Hist 182 and one course selected from Hist 136, 150, or 157; (5) PSc 140 and 142 or 144; (6) 15 semester hours from one of the group options listed below:

Group I. International politics—courses concerned with theory and practice in international affairs, forces shaping the world scene, and American foreign policy, selected from Geog 125, 126, 127, 139, 146 (if not elected to satisfy the major requirement); Hist 137, 139–40, 149; PSc 105–6, 107, 108, 121, 130, 131, 146, 149, 161, 178, 182 (PSc 142 or 144 may be elected if not taken to satisfy the major requirement).

Group II. International economics—courses concerned with the world economy and American policy and practice in international trade and finance, selected from BAd 176, 178; Econ 101, 102, 104, 121, 122, 134, 147, 151; Geog 125, 126, 127, 135; Stat 111, 112.

Group III. International communications—courses concerned with the study of international information programs, public opinion, psychological warfare, cultural relations and public relations, selected from Anth 150, 153, 157, 161, 168; Geog 106, 125; Jour 145, 146; PSc 120, 146; Psyc 115, 151, 156; Soc 144.

Group IV. Regional study—a concentration in one of the following areas: (1) Africa—courses selected from Anth 178; Hist 116; PSc 180, 181, 182; (2) Europe—courses selected from Econ 147; Hist 128–29, 131–32, 141–42, 147, 149, 151–52, 158; PSc 105–6, 130, 131, 161; (3) Far East—courses selected from Anth 173, 175; Chin 163–64; Econ 169; Geog 164; Hist 137, 187, 188, 195–96; PSc 105, 170, 173; (4) Latin America—courses selected from Anth 170, 172, 185; Econ 185; Geog 161; Hist 163–64, 165, 166; PSc 183, 184; interdisciplinary seminar 287 (PSc 285) offered by six departments participating in the Latin American Studies program; (5) Middle East—courses selected from Anth 177; Hist 158, 193, 194; PSc 177, 178, 179, 180; Rel 161; or (6) Soviet Union and Eastern Europe—courses selected from Econ 133, 134; Hist 137, 143, 145, 146, 188; PSc 108, 131 or 165, 168; Slav 161–62, 165, 166, 193–94.

PUBLIC AFFAIRS

The major in Public Affairs deals with domestic government and policy.

Prerequisite—The Public Affairs curriculum, pages 79–80.

Requirements for the Major—(1) Econ 101, 161, 162; (2) Hist 175–76; (3) PSc 114 or 115, 116 or 117, 119; (4) 12 semester hours from one of the group options listed below:

Group I. Economics—courses selected from Econ 102, 104, 121, 122, 123, 136, 142, 165, 181–82.

Group II. Politics—courses selected from PSc 106, 110, 111, 112, 116 (if not taken as a major requirement), 118, 120, 121, 122, 124, 130, 146.

Group III. Urban affairs—courses selected from BAd 174; Econ 157; Geog 140, 141, 142; PSc 111, 112; Soc 126; U&RP 153.

URBAN AFFAIRS

The Urban Affairs program is designed for undergraduates interested in urban-related occupations, in furthering their knowledge about theories and findings related to urban life, or in acquiring the tools that will help them to effectively apply themselves to the task of devising solutions to the problems that cities and their residents face. The program consists of a focused set of courses that introduces the student to the problems and issues of urban America from the perspectives of various social science disciplines.

The central focus of the program is on urban public policy—the various forces that shape it, and its adequacy relative to current and anticipated needs. Within the overall framework, students can specialize in either the political and social, economic and financial, design, or research methodological aspects of urban studies. In the senior year each student serves an internship in an urban-related agency or research organization and also attends a weekly seminar restricted to urban affairs majors. Each student is encouraged to work closely with the urban affairs advisor to develop a program tailored to personal interests and goals.

Prerequisite—The Urban Affairs curriculum, page 80.

Requirements for the Major—(1) Urban Affairs core courses: Econ 157; Geog 140; Hist 186; PSc 101, 111, 112; and one course chosen from among Stat 51, 53, or 111. (2) Special Urban Affairs fields: each student will be required to take four courses from within one of the following four fields of specialization, and two courses from each of the others. Field A. (Urban Research Methods): Stat 51, 53, or 111; Stat 112, 97, 105, 117, 123; Acct 115. Field B. (Political and Social Urban Analysis): PSc 104, 111, 113, 124; Soc 126 and 128; Soc/Econ 153; PAd 190. Field C. (Urban Economics and Financial Analysis): Econ 101, 136, 161, 162, 165; BAd 113. Field D. (Urban Design and Spatial Analysis): AmCv 177; Geog 141, 142, 143; U&RP 153, 201. (3) Senior Internship and Seminar: PSc 188 and 193—the grade of *P* (Pass) or *NP* (No Pass) will be given for PSc 188. A student may elect to fulfill the internship requirement in a paid position in lieu of registering for PSc 188; however, the student must substitute six semester hours of elective course work.

THE DEGREE OF MASTER OF ARTS

The School offers degree programs leading to the Master of Arts in the fields of East Asian Studies, International Affairs, Latin American Studies, Middle Eastern Studies, Public Affairs, Russian and East European Studies, Security Policy Studies, and Science, Technology, and Public Policy.

ADMISSION REQUIREMENTS

Application forms are available from the Office of Graduate Admissions, School of Public and International Affairs, George Washington University, Washington, D.C. 20052.

A bachelor's degree from an accredited college or university, with a *B* average or better, or the equivalent, in the relevant undergraduate major,

is normally required. If there is evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of *B* will be given serious consideration. Scores on the Aptitude Test of the Graduate Record Examinations as well as letters of recommendation are required.

In East Asian Studies—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should include 24 semester hours of Chinese language study.

In International Affairs—The applicant's undergraduate program should include background courses corresponding to the interdepartmental undergraduate major in international affairs at this University (see page 172), or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

In Latin American Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American Studies at this University (see pages 374-75) or equivalent. Majors in other fields may be considered for admission provided their undergraduate course work includes Spanish or Portuguese and sufficient course work in three of the following six areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

In Middle Eastern Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Middle Eastern Studies at this University (see pages 171) or equivalent.

In Public Affairs—An undergraduate major in public affairs, economics, history, or political science, depending upon the field of specialization in the master's program, is required. Students entering the program are assumed to have had some college-level course work in American government and politics, American history, and economic theory. To the extent that a student lacks such a background, the student must, in consultation with an advisor, undertake the appropriate remedial course work, including some courses which may be taken for graduate credit.

In Russian and East European Studies—An undergraduate major in a pertinent field is required. The undergraduate program should include the following courses, or equivalent: Hist 145, 146; PSc 131 or 168; Slav 1–2 and 3–4, or 5–6.

In Science, Technology, and Public Policy—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences, particularly economics, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

In Security Policy Studies—An undergraduate background similar to that specified above for International Affairs would be appropriate. Working experience in the military or national security fields might compensate in

part for inadequate academic preparation. A background in economics or quantitative analysis skills would also be helpful.

Readmission

A graduate student who has not been continuously enrolled, or on approved leave of absence or inactive status, must file an application for readmission the semester before planning to return to school. Applications for readmission are reviewed by the dean and the Committee on Admission.

GENERAL REQUIREMENTS

There are two options available in all programs leading to the Master of Arts degree except Security Policy Studies, in which only the nonthesis option is available, and East Asian Studies (with a concentration in Chinese language and literature), in which only the thesis option is available. One option requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for six semester hours of *Thesis Research* (299-300). The second option requires a minimum of 36 semester hours of graduate course work and does not include a thesis. The course work for both options is taken in preparation for the Master's Comprehensive Examination.

Candidates for the degree of Master of Arts are required to submit an advisor-approved "Program of Studies" (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester in residence.

Master's degrees are awarded by vote of the Faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examination.

Under special circumstances second-group courses (numbered 101-200) may be counted toward the master's degree when registration for graduate credit has been approved at the beginning of the course by the curriculum advisor, the instructor and the dean. The student who takes an undergraduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular work of the course. Normally, no more than six semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than nine semester hours may be taken for graduate credit in the 36-semester-hour program. (The one exception to this rule is the case of students who select one or more fields in history; they may take nine hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All work for a master's degree must be completed in five years, unless an extension of time is granted by the dean. A student who is temporarily unable to continue the program of studies may request a leave of absence not to exceed one year.

No credit is granted for work done *in absentia* or without formal instruction, except for the thesis, which may be completed *in absentia* with the permission of the curriculum advisor and the dean. No more than six semester hours of graduate credit may be transferred from other ac-

credited institutions or another division of the University, and these may be accepted only under limited conditions of time, grades, and relevance to the student's program.

Tool Requirements

In most programs of study a candidate for the degree of Master of Arts must demonstrate a reading knowledge (certified by the appropriate language department) of at least one modern foreign language, to be approved by the dean. A master's degree candidate whose native language is not English may not select the native language to meet the tool requirement; the candidate may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the fields of Public Affairs, Security Policy Studies, and Science, Technology, and Public Policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency at the level of Stat 105, 112, or 197.

Candidates in International Affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work; it must be taken before the comprehensive examination. No student may take the language or tool examination more than three times.

Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree.

Master's Comprehensive Examination

In addition to any course examinations, the candidate must pass a written Master's Comprehensive Examination. Examinations are scheduled twice a year (usually in November and April), and should be taken during the last semester of course registration or shortly after the completion of the prescribed course work. If there is a lapse of time between completion of course work and the examination, the student must be enrolled continuously during this period. The candidate must consult with the advisor, well in advance, as to the date of the examination and the definition of the subject-matter fields which this examination is to cover. It should be understood, however, that course work constitutes only partial preparation for the Master's Comprehensive Examination. Each student is also expected to pursue a program of additional reading in each of the selected fields, in accordance with the advice of the faculty members responsible for instruction in that field. An oral examination on the thesis or major report may also be required.

Scholarship Requirements

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; and *Z*, Failure, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be counterbalanced by a grade of *A* in a graduate course of equal status.

A master's candidate who receives a grade of *F* is required to present cause for consideration by the Dean's Council as to why the student should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an "Incomplete" cannot be made up after the lapse of one calendar year. An "Incomplete" which is not removed by the end of one calendar year remains as a grade of *I* on the student's record. An "Incomplete" cannot be removed by reregistering for the course. No student will be permitted to register for courses in a new academic year, or take the Comprehensive Examinations, if there are more than two "Incompletes" outstanding on the record.

A student who fails to meet the established deadlines for completion of course work or other elements of the program (e.g., comprehensive examinations) and is granted an extension may be required by the Dean and the Dean's Council to register for three credit hours of graduate "Reading and Research" for each semester that the work is delinquent.

The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the course work. A student will not be permitted to register for Thesis Research (299-300) until the thesis subject has been formally submitted to the Dean's Office. The subject must be approved by the student's advisor and the member of the Faculty under whom the thesis is to be written. The thesis in its final form must have the approval of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Dean's Office.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, the student must maintain continuous enrollment, and is allowed one calendar year to complete it. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the enire six hours of thesis again and pay tuition as for a repeated course.

Degree Programs

Specific requirements for each of the eight degree programs leading to the Master of Arts are listed below. For prerequisites, see "Admission Requirements," pages 173-75.

EAST ASIAN STUDIES

The Master of Arts in the field of East Asian Studies is an interdisciplinary

program which includes course work from at least four of the following disciplines: Chinese language and literature, economics, geography, history, and political science.

The degree program consists of 30 semester hours of course work, including six hours of thesis research, or 36 semester hours of course work without a thesis. Each candidate must pass a Master's Comprehensive Examination in one major and one or two minor fields. To fulfill the tool requirement candidates must demonstrate proficiency in either Chinese or Japanese language; with the permission of the dean, another East Asian language may be substituted. (As preparation for this requirement, a special Chinese language course will be available to students in the program.)

Only the 30-semester-hour thesis option is available to students selecting a concentration in Chinese language and literature. That program includes 12 semester hours of Chinese language and literature, six hours of history, six hours of electives selected in consultation with the advisor, and six hours of thesis research.

INTERNATIONAL AFFAIRS

The interdisciplinary program leading to the degree of Master of Arts in the field of International Affairs provides the student with a wide choice of fields within three broad areas of study: general, supplemental or special, and regional. Graduate courses in anthropology, business administration, economics, geography and regional science, history, political science, psychology and sociology relate to these fields, which are listed below:

General Fields of Study—International politics, comparative government and politics, modern political theory (including socialist and communist theory) and international economics.

Supplementary or Special Fields—International law; international organization and administration; international economic development; international and comparative aspects of communism; U.S. diplomatic history; U.S. foreign policy; science, technology, and public policy; 20th century British defense and foreign policy; and U.S. national security policy.

Regional Fields—Modern history, or government and politics, or economic history and problems of one of the following: Western Europe, Eastern Europe, the Soviet Union, Latin America, the Middle East, Africa, South and Southeast Asia, Japan, and China. Within each geographical area there are normally three fields of study available.

Each degree candidate must select at least one general field. The fields should also represent at least two disciplines. Beyond these limits, the student is free to select any of the fields indicated above as long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields of study in the Master's Comprehensive Examination.

Candidates who elect to write a thesis must choose *three* of the listed fields and take, in addition to the thesis, a minimum of 24 semester hours of graduate course work in at least two departments, with no more than 15 hours in any one department.

Candidates electing a program without a thesis must choose *four* fields and may take no more than 21 of their required 36 semester hours in one department. They must also include in their program at least two re-

search seminars (six semester hours) requiring the preparation of substantial research papers.

LATIN AMERICAN STUDIES

The program leading to the degree of Master of Arts in the field of Latin American Studies is designed to provide the student with an appropriate area background in three or four of the following fields: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

All degree candidates must complete 12 semester hours of graduate work, including the interdisciplinary seminar (287), in a major field selected from those listed above, and six semester hours in each of two minor fields selected from those listed above. Students who elect not to write a thesis, must take six semester hours in a third minor field selected from those listed above, or from the fields of urban and regional planning, economic development or population studies. The student must further complete an additional six semester hours in any of the major or minor fields selected. The tool requirement must be satisfied by demonstration of proficiency in Spanish or Portuguese, or in English if the student's native language is Spanish or Portuguese. The Master's Comprehensive Examination will cover all the student's selected fields.

MIDDLE EASTERN STUDIES

The interdisciplinary program leading to the degree of Master of Arts in the field of Middle Eastern Studies offers the student an appropriate area background in three or four of the following fields: domestic politics, international relations, history, economics, geography and regional science, anthropology, religion, philosophy, art, and literature. One approved field from the international affairs curriculum may also be included.

The degree program consists of 30 semester hours of course work including six hours of thesis research, or 36 semester hours of course work without a thesis. In the 30-hour program, students select one major and two minor fields; in the 36-hour program, students chose one major and three minor fields. Written Master's Comprehensive Examinations in these fields will be required of all candidates at the completion of the degree program. All students must meet the prescribed basic preparation of three credit hours in Middle Eastern international relations, domestic politics, and modern history, and must satisfactorily complete the interdisciplinary seminar offered by this program. To fulfill the tool requirement, candidates must demonstrate reading knowledge proficiency in an approved modern Middle Eastern language.

PUBLIC AFFAIRS

The program leading to the degree of Master of Arts in the field of Public Affairs allows the student to specialize in either domestic economics or domestic politics. The student may select courses in consultation with an advisor to emphasize either political science, economics, or American history, provided (1) that no more than 15 hours of courses are elected in one department under the 24-hour program with a thesis, or (2) that no

more than 21 hours are elected in one department under the 36-hour program without a thesis. Course work may include economics (public finance, monetary theory and policy, labor economics, industrial organization, natural resources and environmental economics, regional and urban economics, economic policy); history (U.S. political history, U.S. economic history, recent U.S. history); political science (domestic politics and government, Congress and the presidency, U.S. constitutional law and politics, state and urban politics, political science research methods, and science, technology, and public policy).

RUSSIAN AND EAST EUROPEAN STUDIES

This degree program is designed to give the student a broad grasp of Russian and East European affairs on an interdisciplinary basis, with emphasis on the period since 1917. The program provides an opportunity for students to gain knowledge of special areas of interest from among the following: Soviet internal and external affairs (required field of study), Soviet and Eastern European economics, ideology and thought, Russian literature and culture, Soviet military policy and strategy, 19th-century Russian history, comparative and international aspects of communism, Eastern European history, Eastern European government and politics, and advanced Soviet government, politics and foreign policy.

The degree program consists of 30 semester hours including 6 hours of thesis research, or 36 semester hours of course work without the thesis. All students must take 6 to 9 hours in the interdisciplinary field covering Soviet internal and external affairs. In the 30-hour program, students select two other fields and must include one course in Eastern European history or politics; in the 36-hour program, students select three other fields and must include one field in Eastern European history or politics. All candidates will be required to take Master's Comprehensive Examinations in these fields. Before the Comprehensive Examinations can be taken, Russian language proficiency must be demonstrated in a reading comprehensive examination. All students must have the required background preparation of at least 9 credit hours in Russian history and Soviet government and politics, and 12 credit hours in Russian language study.

Students in the concentration in Russian literature and culture may take either the thesis or non-thesis option. They must take the required field in Soviet internal and external affairs in addition to the selected fields in literature and culture. The approved fields include 19th-century Russian literature, Soviet literature, and Russian culture.

SCIENCE, TECHNOLOGY, AND PUBLIC POLICY

The program leading to the degree of Master of Arts in the field of science, technology, and public policy is flexible and is carefully planned and conducted in consultation with an advisor. All degree candidates are required to take 12 semester hours in the core field of science, technology, and public policy, which includes course work both in science policy and in policy analysis. A second field must be chosen from one currently offered in the international affairs or public affairs programs of the School. Students who elect to write a thesis must select one additional field, and those who elect not to write a thesis must select two additional fields. The third

and fourth fields may also be chosen from those currently offered in international affairs or public affairs, or may be interdisciplinary, developed in consultation with the advisor and focusing on a particular policy issue or area. Such a special field must be approved by the student's advisor and the dean.

SECURITY POLICY STUDIES

The 36-hour, four-field program leading to the degree of Master of Arts in the field of security policy studies is explicitly policy-oriented, and professional in the sense of attempting to prepare students for policy-oriented positions in the defense/national security field. A student's degree program will be carefully planned with an advisor. All degree candidates are required to take 12 semester hours in the core field of defense policy analysis. In addition, students should have a minimum competence in economics equivalent to Econ 217-18. At least one field should be selected from among the following: international security policy; military history/history of strategic thought; Soviet military policy and strategy; science, technology, and public policy; and advanced quantitative analysis. The remaining two fields are to be selected from any of the above, or from any other field offered in the School's various programs. The tool requirement must be satisfied by demonstration of proficiency in statistics or a foreign language.

SPECIAL PROGRAMS

Combined Master of Arts and Juris Doctor Degree Program

The School of Public and International Affairs cooperates with the National Law Center in offering a program leading to the combined degrees of Master of Arts and Juris Doctor. A student must be accepted for admission by both the School of Public and International Affairs and the National Law Center. Applications should be made separately, but at the same time. Both the School and the Center should be notified that the student is interested in the combined program. The student will be admitted to the School of Public and International Affairs for the academic year following the first year of study at the National Law Center, since the National Law Center stipulates that the first year of coursework for the Juris Doctor degree must be taken as a unit.

The Master of Arts degree program normally consists of the 30-semester-hour program which includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to six semester hours of credit for course work completed as part of the Juris Doctor curriculum and related to the student's degree program may be approved for transfer toward the Master of Arts degree. (Some of the course work required for the Master of Arts degree program may be applicable toward the Juris Doctor degree requirements.) Students will be registered in both the School of Public and International Affairs and the National Law Center and must maintain this concurrent registra-

tion until all degree requirements have been completed. All work for this combined degree program must be completed in five years, unless an extension of time is granted by the dean.

Institute for Sino-Soviet Studies

The Institute for Sino-Soviet Studies provides a program of specialized graduate study and research within the School of Public and International Affairs. Courses of the Institute are drawn from a variety of academic areas and thus provide an interdisciplinary approach to the study of the Soviet Union, Eastern Europe, and East Asia, and of the Communist movement within and among the countries of these areas. Faculty members conduct seminars and reading courses in the disciplines of economics, geography, history, language and literature, law, political science, and psychology. Research work is integrated with the teaching program.

Students who are preparing for the degree of Master of Arts in the fields of East Asian studies, international affairs, and Russian and East European studies in the School of Public and International Affairs, or for the degree of Master of Arts in the fields of economics, history, or political science in the Graduate School of Arts and Sciences, with specialization in Sino-Soviet studies, may take course work from the Institute's offerings.

Students working toward the degree of Doctor of Philosophy in international relations with special emphasis on the Sino-Soviet area are expected to combine work in the Institute with work in the fields of economics, history, and political science. Doctoral candidates in the field of political science will take their Sino-Soviet work in the form of appropriate subfields of the major and minor fields. Doctoral candidates in the field of history are expected to take at least two of the four fields for the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences and consultative committees designated by that School which direct the work of each graduate student upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. A candidate for such a degree should assume that the committee will require the substitution of a reading examination in Chinese or Russian for one of the two Western languages normally required for the degree.

A brochure describing in more detail the work of the Institute is available upon request.

DIVISION OF UNIVERSITY AND SUMMER STUDENTS

Dean W.F.E. Long
Associate Dean S.R. Paratore
Assistant Dean L.S. Paul

INTRODUCTION

The Division of University and Summer Students makes courses available to those who are not currently degree candidates at this University. Such students, often employed in government or industry, may be taking courses to increase their vocational fitness or as a matter of personal interest. They may be candidates for higher degrees in other institutions, sent here for special work as part of a graduate program. They may be undergraduates matriculated elsewhere, taking courses for transfer to their own institution.

All courses except those restricted to medical and law students and courses in the departments of Accounting, Business Administration, and Management Science, are open to nondegree students, provided they have sufficient preparation as determined by the academic departments. Students wishing to take engineering and applied science courses should consult the *School of Engineering and Applied Science Bulletin*.

Registration in a given course may be denied students in this Division when space is needed for degree candidates. Students in this Division are not eligible to register for thesis or dissertation research. This Division requires a minimum registration of three semester hours per semester or session.

ENTRANCE REQUIREMENTS*

An academic background appropriate for the program of studies contemplated is required. In addition, the applicant who has previously attended this or another college or university must be in good standing at that institution. An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission to the Division for one calendar year after the effective date of the suspension. An applicant who has been denied admission elsewhere within this University may be considered for admission to the Division upon recommendation of the appropriate department and school or college.

Applications for admission to the Division during a fall or spring semester must be received no later than the Friday before the first day of registration (see the Calendar, pages 5-7). Applications for admission to the Division during the summer should be submitted at least two working days prior to registration day. In both cases, however, applicants are urged to apply earlier. There is no application fee.

REGULATIONS

Regulations concerning admission, registration, fees and finances are stated on pages 20-32; other University regulations, on pages 44-52.

* For admission requirements for students from foreign institutions, see pages 26-27.

Prospective and registered students are urged to acquaint themselves with the regulations concerning attendance (see page 44) and withdrawal (see page 47).

The following specifically apply to all students in the Division of University and Summer Students:

Last day to add a class for credit—end of second week of classes.

Last day to drop a class for credit or to withdraw from the University—end of the seventh week of classes.

Equivalent amounts of time apply to the summer sessions.

Academic Work Load

The normal academic work load during the regular academic year is not more than 10 semester hours for a student employed more than 20 hours per week and not more than 18 semester hours for a full-time student. During the summer a student may take a maximum of two courses during any one session. Exceptions to these limits must be approved by the dean.

Scholarship Requirements

A student who fails to maintain the scholarship requirements of this Division may be dismissed from the University. A statement of scholarship requirements is available in the office of the dean.

All grades received in the Division of University and Summer Students remain on the record, and scholarship requirements are based on the total record.

Grades

Undergraduate—*A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; Z, Failure, Unauthorized Withdrawal.

Graduate—For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; Z, Failure, Unauthorized Withdrawal; *CR*, Credit.

For both undergraduate and graduate courses there is also a pass/no pass option, which permits students to take courses in which they receive the grade of either *P*, Pass, or *NP*, No Pass. There is no limitation on the number of courses that may be taken pass/no pass in this Division; however there may be a limit on the number that can be transferred to fulfill degree requirements.

Incomplete/Authorized Withdrawal

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—The instructor normally sets a period (maximum of one year) within which the uncompleted work must be made up. An Incomplete which is not removed within one calendar year remains as a grade of *I* on the student's record.

Change in Program of Studies

Change within the Division of University and Summer Students—A stu-

dent may not change or drop courses (see "Withdrawal," page 47) or change status to that of auditor except with the approval of the dean.

Transfer within the University—Transfer to or from the Division of University and Summer Students may be made only with the approval of the deans concerned.

Application for transfer to degree candidacy will be considered only after the completion of at least one semester in the Division or upon request from the college or school to which the student is seeking admission.

Students wishing to transfer to degree candidacy must meet the conditions of the college or school to which they are applying. It is the responsibility of the student to consult the relevant degree-granting college or school concerning all conditions to be met and the amount of work transferable.

THE SUMMER SESSIONS

During the summer of 1981, Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Government and Business Administration, the School of Public and International Affairs, the School of Engineering and Applied Science, the Division of University and Summer Students, and the School of Medicine and Health Sciences offer courses in one three-week session (May 11-June 3) and two five-week sessions (June 8-July 13 and July 15-August 19). The National Law Center offers courses in two six-week sessions and one 13-week session; the School of Education and Human Development offers courses in three- and six-week sessions. The University also offers special programs during the summer which are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the 1981 spring semester may register for the Summer Sessions without special application. All others must apply for admission or readmission. There is no application fee. Students who wish degree status may seek admission from the appropriate college or school within the University. Those who do not wish to work toward a degree at the University may apply through this Division. Such students should also read the sections on Entrance Requirements and Regulations.

For a complete statement concerning summer term work, see the *Summer Sessions Schedule of Classes*.

COLLEGE PROGRAM FOR SECONDARY-SCHOOL STUDENTS

The George Washington University College Program for Secondary-School Students provides the promising high-school student an opportunity to take fully accredited college courses along with college students.

To take advantage of the University's unique location in the nation's capital, a diversified cultural and recreational program is arranged. Opportunities for observation, study, service, and recreation are limited only by the student's time, energy, and imagination.

Courses are available full-time during the Summer Sessions to eligible students and part-time throughout the year to eligible commuting students concurrently with their high-school program. Dormitory residence space is not provided for part-time students.

Secondary-school students with outstanding records may apply for a summer scholarship which covers approximately half of the total cost of room and board, tuition, the recreational-cultural program, health services, and Marvin Center fees. During the fall and spring semesters, commuting students with outstanding records may apply for a scholarship covering half of tuition costs for courses to be taken concurrently with secondary-school courses. The approval of the applicant's principal or guidance counselor is necessary. A transcript of the applicant's grades to date, including available standard test scores, is required.

Application forms and further information may be obtained by writing to the College Program for Secondary-School Students, Admissions Office, George Washington University, Washington, D.C. 20052.

DIVISION OF EXPERIMENTAL PROGRAMS

Director R.S. French
Assistant Directors L.J. Lear, L.P. Love

The University is committed to the continuous development of new curricular options for its faculty and students. The Division of Experimental Programs has as its function the support of such curricular experimentation and development. This University-wide curricular development program has three objectives: (1) cooperation among the academic divisions of the University in the development and sponsorship of new courses and programs; (2) experimentation with new ways of teaching and learning; and (3) a more direct relationship between campus and off-campus resources and interests. In pursuit of these objectives the Division awards faculty fellowships for interdisciplinary research, sponsors student-faculty societies for interdisciplinary education, and regularly organizes regional conferences on educational issues. The Division administers the Center for Washington Area Studies, which coordinates Washington-related research and teaching conducted by numerous academic departments and programs throughout the University. Through the Center the Division supports an annual conference on local history, publishes a monograph series (*GW Washington Studies*), and sponsors each academic year the Banneker Visiting Professor of Washington Studies.

Under the auspices of the Division of Experimental Programs, students, faculty, and administrators throughout the University are involved in the planning, teaching, and evaluating of experimental courses and degree programs. Many curricular experiments which receive financial support through the Division of Experimental Programs are sponsored by other academic units of the University, e.g., the 700 Series of Courses in General and Interdisciplinary Studies. There are presently two academic programs directly sponsored by the Division—the Program in Experimental Humanities and the Service-Learning Program.

The Program in Experimental Humanities offers courses which provide opportunities for students to combine sustained field study with classroom work. These courses are sometimes taught by interdisciplinary and interdivisional faculty teams. Some Experimental Humanities courses are residential courses in which students enrolled in the same class also live together in designated areas of university housing.

The Service-Learning Program integrates off-campus, preprofessional work placements with classroom seminars. Students in the program are placed in community groups, research organizations, or governmental agencies. Assignments are arranged by means of a formal agreement among the student, the program, and the off-campus placement. Instructors in the seminars are members of the faculty in one of the professional schools of the University.

The Division of Experimental Programs is charged with mobilizing academic resources throughout the University that can appropriately address needs in the Washington metropolitan community. Among the activities of the Division is a community assistance program in the Anacostia area. Selected students receive stipends for services to residents and work with community organizations.

ASSOCIATES

William H. Becker, *Faculty Associate for Business Studies*
Thelma Z. Lavine, *Faculty Associate for Interdisciplinary Studies*
D. Joanne Lynn, *Faculty Associate for Humanities and Medicine*
Colin M. Turnbull, *Faculty Associate for Community Studies*

STEERING COMMITTEE

Harold Frederick Bright, *Provost and Vice President for Academic Affairs, Chairman*
Lawrence Thompson Bowles, *Dean of the Medical Center, for Academic Affairs*
Marcella Brenner, *Professor of Education*
Carl James Lange, *Professor of Psychology; Vice President for Administration and Research*
Norma Maine Loeser, *Professor of Business Administration; Dean of the School of Government and Business Administration*
Ralph Clarke Nash, *Professor of Law*
Judith Ann Abrams Plotz, *Associate Professor of English*
Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*

POLICY STUDIES AND SPECIAL PROJECTS

Vice President for Policy Studies and Special Projects L.H. Mayo

The Vice President for Policy Studies and Special Projects is responsible to the President of the University for developing an interdisciplinary capability for analyzing national policy issues. There is involvement with the Consortium universities and with foundations, federal agencies, industry, and other organizations which interact with the governmental process.

The office serves the University as a locus for discussion and as an advisory resource on interdepartmental and interdisciplinary research related to the analysis of public policies, and on curricula pertaining to broad social or environmental problems.

The University has sustained an institutional commitment, in terms of faculty recruitment and program emphasis, to issue-oriented policy analysis as a major focus of teaching and research activities. The result of thirteen years of development is a significant, institutional capability for comprehensive analysis of complex policy issues. Major programs oriented to public policy and governmental functions, which come within the ambit of this office, are described below.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

Director L.H. Mayo

The Program's primary objective is the continuing development of a University-wide policy research capability related to problems stemming from the impact of technological change on the processes, values, and institutions of society. The Program provides a neutral forum for consideration of these policy issues—whether in a retrospective, current, or prospective context—and provides an advisory and research resource for policy makers in the public and private sectors.

The Program's primary components are:

1. *The Technology Assessment Group*—The Program has been closely involved with the evolution of the concept of Technology Assessment (TA), which has become federally institutionalized in the Congressional Office of Technology Assessment. Much of the early work of the Program consisted of theoretical, methodological, institutional, and historical studies. Since 1973, however, the TA Group has carried out studies in a variety of subject areas including transportation, energy, community development, environmental noise, communication, and governmental structure and process, under contracts or grants from most of the major Federal agencies.

2. *The Graduate Program in Science, Technology, and Public Policy*—This Master's degree program—co-sponsored by the Program of Policy Studies and the School of Public and International Affairs (SPIA)—combines graduate training in science policy analysis with major research undertakings. In six years, the program has become the largest degree-granting

science policy program in the United States. Admissions information is contained in the SPIA section of this *Bulletin*.

3. *The Behavioral Studies Group*—This part of the Program focuses on the social and behavioral factors associated with technological development. It is a multidisciplinary group, with expertise in motivational and behavioral aspects of technology assessment in the areas of transportation, energy use, communication, energy conservation, new town program development, public health (family planning, community mental health), and education. Work includes applications of TA to program development and evaluation, as well as to dissemination and utilization of strategies to improve the constructive uses of technologies in these areas.

The Program of Policy Studies normally has between 15 and 20 professionals and many students working on several projects, most of which are problem-oriented and interdisciplinary in nature. Members of the faculty, graduate students, members of governmental agencies, and special consultants are regularly involved in our studies. To date the Program has performed over 75 policy studies and has published over 100 reports, monographs, books, and special papers which have been distributed to professionals and institutions throughout the world. Funding for the professionals and institutions throughout the world. Funding for the Program's activities has come from a variety of sources: the University; federal agencies, including DOT, EPA, ERDA, HEW, HUD, NASA, Commerce, OTA, and NSF; and private foundations, including The Ford Foundation.

Professional Associates

Director Louis H. Mayo, *Vice President for Policy Studies and Special Projects; Professor of Law*
James M. Brown, *Senior Staff Scientist; Professor of Law*
Craig A. Decker, Jr., *Consultant (Appropriate Technology)*
Lynne D. Filderman, *Research Associate (Policy Analysis)*
Henry B. Freedman, *Research Associate (Business Administration)*
Charles V. Kidd, *Senior Staff Scientist (Public Affairs)*
Samuel Robert Lichter, *Assistant Professor of Political Science*
John M. Logsdon, *Research Scientist; Director, Graduate Program in Science, Technology, and Public Policy; Professor of Public Affairs and Political Science*
Joseph B. Margolin, *Senior Staff Scientist; Director, Behavioral Studies Group*
Marion R. Misch, *Research Scientist; Deputy Director, Behavioral Studies Group*
Henry R. Nau, *Graduate Program in Science, Technology, and Public Policy; Associate Professor of Political Science and International Affairs*
Herman Pollack, *Research Professor of International Affairs (Political Science)*

NATIONAL HEALTH POLICY FORUM

Judith K. Miller, *Director*
Marion Ein, *Associate Director*

The National Health Policy Forum assists professional staff members employed by the executive and legislative branches of the federal govern-

ment in the health field to obtain a more realistic understanding of actual health practices and problems, and to improve communications between Washington-based professional staff members and experts in the field. Exposure to problems and issues facing the entire country is gained primarily through sequenced evening discussions or workshops and, where appropriate, site visits to various localities. Although attendance is primarily limited to Congressional aides and top-level health staff from the many government agencies involved in health, GWU students and faculty can be accommodated on a space-available basis.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

Samuel Halperin, *Director*
Paul Schindler, *Deputy Director for Development*
Elizabeth Hale, *Director of State and Local Programs*
Harriet Bernstein, *Director, Educational Staff Seminar*
Alvin Rivera, *Senior Associate*
John Merrow, *Producer, "Options in Education"*
A. Sidney Johnson III, *Director, Family Impact Seminar*
Theodora Ooms, *Deputy Director*
Ruth Hubbell, *Associate Director for Research*
Robert Miller, *Coordinator, Washington Policy Seminar*
Diane Brundage, *Coordinator of Communications and of Journalism Programs*
Lisa Walker, *Coordinator, Education of the Handicapped Policy Project*
Dietra Hallums, *Director, Administrative Services Division*
Patrick Barbati, *Director, Financial Services Division*

The Institute for Educational Leadership (IEL) seeks to strengthen present and potential leadership in American education at the policy levels of state and federal government. Established in 1971, IEL is a policy planning and coordinating agency for a number of related educational programs, including Education Policy Fellowship Program, Educational Staff Seminar, The Associates Program, "Options in Education" over National Public Radio, Washington Policy Seminar, Family Impact Seminar, and Ford Fellows in Educational Journalism. IEL is supported by a major grant from The Ford Foundation and by various grants from foundations and federal agencies.

The objectives of the Institute are carried out under the following programs and activities:

1. *Education Policy Fellowship Program* (formerly Washington Internships in Education) is a national program designed to help provide future educational leaders with skills in policymaking for effective and enlightened leadership. Funds for the program are provided by the Ford, Rockefeller, and Cleveland Foundations. Since 1964, the program has placed over 550 mid-career persons in one-year internships in public and private agencies involved in educational policy matters.

2. *Educational Staff Seminar* is a professional development program designed for staff members employed by the executive and legislative branches of the federal government in the field of education. It is designed to expose these federal education policymakers to existing programs

throughout the nation, and to innovations, research, and emerging ideas in the field.

3. *The Associates Program* is an evolving IEL activity. Its emphasis has been to provide seminars for legislators and other policymakers at state capitals. Begun in 1972 with three state educational seminars, the Program now sponsors 31 seminars, all directed by Associates who arrange five to ten programs annually.

The Program maintains a network of state-level "generalists" (Associates) whose ties to IEL in the nation's capital provide rare linkages among federal and state education policy-setters. It also sponsors national and regional conferences dealing with state-level responsibilities in education.

4. *"Options in Education,"* co-produced by IEL and National Public Radio, is a weekly series heard over most of NPR's 190 member stations from coast to coast. Voice of America rebroadcasts the one-hour programs, and IEL makes cassettes and transcripts available at minimum cost. "Options" has received awards from the National Association of State Department of Education Information Officers (1977), the Education Writers Association (1975 and 1976), and the Council for Advancement and Support of Education (1974). A list of NPR member stations and a catalog of available cassettes and transcripts are available from IEL.

5. *Family Impact Seminar* seeks to identify and assess the effect on families and children of a variety of public policies. The Seminar and its several task forces are composed of scholars and policymakers. Together, they examine and test the feasibility of developing "family impact statements" on selected government policies and programs. The specific issues to be examined are selected from a broad range of existing or proposed public policies.

6. *Ford Fellows in Educational Journalism* is an intensive, short-term professional development program for educational reporters and journalists. This pioneering effort has offered 41 Fellows a "sabbatical" from the fast-paced immediacy of daily educational reporting and allows them to pursue a full-time, three-month course of independent study in their designated area of educational interest. The program reflects the conviction that better-informed media will be a direct and positive influence for better education.

7. *The Washington Policy Seminar* brings groups of state educators and policymakers to the Capital for three days of intensive exposure to the processes, people, and institutions which shape federal education policy. Speakers for the Seminar include members of Congress, Congressional staff, senior officials of the Executive branch, leaders of education associations, and seasoned "Washington watchers."

Further information on these programs is available from the Institute for Educational Leadership, Suite 310, 1001 Connecticut Ave., N.W., Washington, D.C. 20036.

SPONSORED RESEARCH

Vice President for Administration and Research C.J. Lange

These special programs were established for the specific purpose of con-
sidering, in an academic atmosphere, problems proposed by the individua
projects or submitted by the sponsoring agency. Cooperation between these
programs and the various departments of instruction is as close as the
nature and needs of the programs and departments will permit.

CENTER FOR SOCIAL POLICY STUDIES

Director Sar Levitan

The Center for Social Policy Studies is devoted to the evaluation of
federally-supported manpower, antipoverty and related programs. The
Center is financed by a grant from the Ford Foundation and offers, in con-
junction with the Department of Economics, graduate courses in labor
economics and social policy.

EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) CLEARINGHOUSE ON HIGHER EDUCATION

Director Jonathan Fife

The Educational Resources Information Center (ERIC) Clearinghouse
on Higher Education, established in the fall of 1968, is supported by the
National Institute of Education. The Clearinghouse is responsible for the
acquisition, evaluation, abstracting, indexing and dissemination of research
reports and other documents dealing with problems and issues in higher
education, prepares state-of-the-art and review papers related to higher
education and responds to individual inquires concerned with higher edu-
cation.

NATIONAL HEALTH POLICY FORUM

See Policy Studies and Special Projects, pages 189-90.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

See Policy Studies and Special Projects, pages 190-91.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

Director W.H. Marlow

The Institute for Management Science and Engineering provides a multi-
disciplinary environment for innovative graduate teaching and substantial
opportunities for research activities and public service under diversified
sources of external support. Through its Program in Logistics, the Institute
performs research leading to the development of a science in logistics
featuring principles and methodology for resource allocation problems in
civil affairs and national defense efforts.

MID-ATLANTIC REGIONAL RESOURCE CENTER

Director Raymond Cottrell
Associate Director Nona Flynn
Assistant Director Linda Foley

The Mid-Atlantic Regional Resource Center is one of a number of centers serving under contract to the Office of Special Education, Department of Education. The area served includes Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia. The primary mission of the project is to assist state education agencies and affiliated agencies within its area to comply with the requirements of PL-142.

NATURAL RESOURCES POLICY CENTER

Director Mary Holman

The Natural Resources Policy Center was established in September, 1965, to sponsor faculty and student research in the area of natural resources and environmental quality; to develop and undertake activities that promote undergraduate and graduate education; and to train employees of public resource agencies. The program of the Center focuses particularly on increasing the contribution of the social sciences to the solution of contemporary problems relating to the management and development of natural resources. The Natural Resources Policy Center, which provides a focus on natural resource and environmental quality problems and issues, is an integral part of the Department of Economics in both the design of its research program and its courses.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

See Policy Studies and Special Projects, pages 188-89.

SOCIAL RESEARCH GROUP

Director Ira Cisin
Associate Director H.J. Parry

The Social Research Group conducts surveys and experiments with concentration on basic research underlying an approach to the solution of social problems.

COURSES OF INSTRUCTION

The following pages contain listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. The courses as here listed are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Evening and daytime sections of the same course are identical, are taught by the same staff of instructors and carry the same amount of credit.

EXPLANATION OF COURSE NUMBERS

First-group courses—Courses numbered from 1 to 100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-group courses—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses, they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit. Accounting courses numbered 101-200 may not be taken for graduate credit.

Third-group courses—Courses numbered from 201 to 300 in the Graduate School of Arts and Sciences and the School of Government and Business Administration, and courses numbered 201 to 400 in the School of Education and Human Development, are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, and the prior approval of the dean. Non-degree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

Fourth-group courses—Courses numbered 301 to 400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301 to 400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education and Human Development fourth-group courses, numbered 401 to 500, are limited to graduate students with master's degrees from accredited institutions.

Fifth-group courses—Courses numbered 701 and 721 represent an ongoing program of curriculum innovation at GW. The 701 number is used to

designate experimental courses taught by individual faculty members. The 721 number designates innovative interdepartmental courses. The 700 numbers do *not* indicate the level of difficulty. Courses in this series range from freshman-level offerings to classes designed for seniors and graduate students. Unless the course description in the *Schedule of Classes* indicates that there are prerequisites or that an interview with the instructor is required prior to registration, 700 courses are open to all interested students, subject only to their advisor's approval and the rules of the respective colleges.

KEY TO ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geob	Geobiology
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCS	Health Care Sciences
HSA	Health Services Administration
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opht	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
RSci	Radiological Sciences

Rad	Radiology
RPol	Regulatory Policy
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
Univ	University
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term "academic year" is used only with two-semester courses, and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Not all offerings for the summer sessions are listed in this *Bulletin*. Students should consult the *Summer Sessions Schedule of Classes* for additional summer offerings. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of course offerings.

ACCOUNTING

Professors E.J.B. Lewis, A.J. Mastro *(Chairman)*, F.C. Kurtz, C.M. Paik, M.G. Gallagher
Professorial Lecturers J. Hilmy, F.W. Segel
Associate Professorial Lecturer E. McReady
Assistant Professors F.J. Rooney, D.R. Sheldon
Assistant Professorial Lecturer P. Ben Ezra
Adjunct Instructors A.C. Riley, J.A. Talbot, G.B. Wright

Bachelor of Business Administration in the field of accounting—See pages 139–46.

Master of Accounting—Required: the general requirements, pages 149–52. All candidates are required to complete 30 semester hours of graduate course work —Acct 211, 221, 232, 251, 261, 263, 264, 275, 282, and Mgt 247—and a comprehensive examination in the final semester of course work or the following semester. A maximum of 6 semester hours may be approved for transfer into the program. Specific prerequisite courses covering the common body of knowledge in business and accounting will vary, based on the student's status upon admission to the program.

Doctor of Business Administration and Doctor of Public Administration, see pages 161–63. Students admitted to the doctoral program with accounting as the major field may be considered for concurrent appointments as Adjunct Instructors. Criteria for selection include a Master's degree and a C.P.A. Courses to be taught are restricted to Acct 51 and 52. See Chairman of the Accounting Department for details.

Accounting courses numbered below the 200 level may not be taken for graduate credit. Accounting courses numbered 200 and above may not be taken for undergraduate credit.

First Group

51–52 **Introductory Accounting** (3–3) Gallagher, Kurtz
(Formerly Acct 1–2)

Basic understanding of accounting concepts, procedures, analyses and reports; the accounting measurement and communications of significant economic and financial data. There is a $25 laboratory fee for Acct 51. Prerequisite: sophomore status. Acct 51 is prerequisite to Acct 52. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 51. (Acct 51 and 52 —fall and spring)

Second Group

101 **Cost and Budgetary Control** (3) Sheldon

Cost behavior and volume-profit relationships, responsibility accounting, standard costs, flexible budgets, cost structures for control and motivation, relevant costs, cost concepts. Prerequisite: Acct 51–52 and junior status. Students who have received credit for Acct 193 cannot receive credit for Acct 101. (Fall and spring)

111 **Financial Statement Analysis** (3) Hilmy

Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Acct 51–52. (Fall and spring)

121 **Intermediate Accounting** (3) Segel

In-depth study of accounting functions and basic theory; acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Acct 51–52 and junior status. Laboratory fee, $25. (Fall)

132 **Accounting Theory** (3) Mastro

Current thought as reflected in the pronouncements of leading professional and accounting research associations, major contributions to accounting literature. Prerequisite: Acct 121 and senior status. (Spring)

141 **Governmental Accounting** (3) Lewis

Appropriation, encumbrance, and fund accounting for governmental and institutional entities. Prerequisite: Acct 51–52. (Fall)

161 **Federal Income Taxation: Individuals** (3) Rooney

A study of federal income tax concepts with primary emphasis on individuals. Prerequisite: Acct 51–52 and junior status. (Fall and spring)

162 **Federal Income Taxation: Corporations, Partnerships, Estates, and Trusts** (3) Rooney

Federal income tax concepts applicable to corporations, partnerships, estates and trusts; tax research and planning. Prerequisite: Acct 161. (Spring)

171 **Auditing** (3) Kurtz

Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, form-preparation-use of audit work papers, audit evidence. Prerequisite: Acct 121 and senior status. (Fall)

181 **Accounting Systems** (3) Hilmy

Data processing considerations in the design and operation of accounting systems. Principles of internal control applicable to manual and automated accounting systems. Prerequisite: Acct 101, 171, and senior status. (Spring)

190 **Special Topics in Accounting** (3) Staff

Experimental offering; new course topics and teaching methods. Prerequisite: Department approval.

191 **Advanced Accounting** (3) Gallagher

Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Acct 121, and junior status. (Spring)

193 **Business Budgeting** (3) Lewis

Principles and procedures in the development, installation, and operation of a system of budgetary control to aid management. Prerequisite: Acct 51–52. Students who have received credit for Acct 101 cannot receive credit for Acct 193. (Fall and spring)

199 **Accounting Practice Internship** (3) Mastro

Concepts, procedures and standards of auditing practice obtained as an intern with a firm or agency. Prerequisite: 15 semester hours of accounting courses (including a course in auditing), senior status, and approval of the chairman of the department. (Spring)

Third Group

201 **Financial Accounting** (3) Kurtz

For designated students in the M.B.A. program. The role of accounting in the decision-making process of external parties; the understanding, interpretation, and implementation of financial accounting. (Course equivalent: a similar graduate financial accounting course, or Acct 51–52, or two similar undergraduate courses.) (Fall and spring)

211 **Business Law for Accountants** (3) Rooney

A study of the legal process and of the principles and precepts of business law; corporations, partnerships, property, trusts, wills, and the legal liability of the accountant. Prerequisite: Master of Accounting status. (Fall)

220 **Management Accounting** (3) Paik

The role of accounting in the decision-making processes of management; understanding of how accounting influences resource allocation

decisions in the organization. Prerequisite: Acct 201. (Fall and spring)

221 **Cost Analysis** (3) Sheldon
An advanced cost accounting course with emphasis on comparative costs and cost accounting standards. Prerequisite: Master of Accounting status. (Spring)

232 **Generally Accepted Accounting Standards** (3) Mastro
A critical understanding of the Financial Accounting Standards Board Pronouncements (Standards) and the Security and Exchange Commission—Accounting Series Releases. Prerequisite: Master of Accounting status. (Spring)

251 **Accounting for Multinational Corporations** (3) Segel
A study of international accounting standards with emphasis on accounting for foreign conversion requirements compatible with domestic accounting consolidation standards. Prerequisite: Acct 201 and 220. (Fall)

261 **Federal Income Taxation of Individuals** (3) Gallagher
A study of federal income taxation of individuals covering gross income, deductions and credits, sales, other disposition of property, capital gains and losses, and timing. Prerequisite: Master of Accounting status. (Fall)

262 **Business Income Taxation** (3) Gallagher
Federal income tax concepts applicable to corporations, partnerships, and their owners; emphasis on tax planning factors in business decisions and tax research. (Fall and spring)

263 **Federal Income Taxation of Corporations** (3) Gallagher
A study of federal income taxation of corporations, covering capital structure, distributions not in and in complete liquidation, and corporate accumulations. Prerequisite: Master of Accounting status or departmental approval, and Acct 261. (Spring)

264 **Federal Taxation of Estates, Gifts, and Trusts** (3) Gallagher
A study of estates, gifts, and trusts covering gross estates, state transfer taxes, valuation problems, planning estate liquidity, complex trusts. Prerequisite: Master of Accounting status or departmental approval, and Acct 261. (Spring)

275 **Contemporary Auditing Theory and Procedures** (3) Kurtz
Study of auditing concepts: generally accepted auditing standards, application of statistical sampling to auditing, audit of electronic data processing systems. Prerequisite: Master of Accounting status. (Spring)

276 **Management Planning and Control** (3) Paik
Integrative case study approach to management systems for planning, control, and decisions: value indices for organizational subunits, transfer pricing, contemporary control systems, accounting framework and cycle. Prerequisite: Acct 201 and 220. (Spring)

277 **Accounting and Decision Systems** (3) Paik
Accounting as a basis for economic decision-making by management and investors. Prerequisite: Acct 201 and 220. (Fall)

282 **Accounting Information Systems** (3) Hilmy
Development and application of accounting system theory, including analysis, design, and implementation. Integration of automatic data processing, accounting systems, and management information systems. Prerequisite: Acct 201 and 220. (Fall)

290 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

298 **Directed Readings and Research in Accounting** (3) Mastro and Staff

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. The courses are open to other graduate students at the discretion of the department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

391 **Accounting Form and Substance—Doctoral Seminar** (arr.) Mastro and Staff
Discourse on current and major accounting issues. Presentation of papers by doctoral candidates and accounting faculty. Monthly, from start to end of doctoral program in accounting. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Mastro and Staff
Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Mastro and Staff
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

See **English.**

AMERICAN STUDIES PROGRAM

Professors R.H. Walker, Jr., C.C. Mondale, B.M. Mergen *(Director)*
Professorial Lecturer L. Miller
Associate Professors J.O. Horton, H.F. Gillette, Jr., J.N. Pearce
Associate Professorial Lecturers C.R. Field, J. Mahoney, Jr., H.W. Marshall, J.K. Zilczer
Assistant Professors P.M. Palmer, M.S. Shapiro
Assistant Professorial Lecturers B.G. Carson, L.D. Lankton, S.J. Zeitlin, P.J. Cressey, J.F. Santino

Affiliated Programs

John Y. Cole (Library of Congress)
Atlee Schidler (Washington Center for Metropolitan Studies)
Wilcomb E. Washburn (Smithsonian Institution)

Faculty Advisory Committee

C.C. Mondale *(Chairman)*, S. Carroll, F.S. Grubar, R.L. Humphrey, J. Moreno, O. Seavey, R.P. Sharkey, R.W. Stephens, D.D. Wallace, Jr., A.M. Yezer

American Studies Council

The Council serves the American Studies Program in an advisory capacity. It includes representatives from the student body, the Washington community, the faculty, alumni, and affiliated programs.

Bachelor of Arts with a major in American Civilization (field-of-study)—The following requirements must be fulfilled:

1. The general requirements stated on pages 74, 81–87.
2. Prerequisite course—AmCv 71–72. (In preparation for the major field it is recommended that students take the introductory American history course and elect introductory courses in anthropology, art, economics, English, geography and regional science, philosophy, political science, religion, and sociology.)
3. Required courses in the major—(a) 15 semester hours of approved second-group courses in an American civilization core field, including U.S. social history (6 hours), American literature (6 hours), and an interdisciplinary elective (3 hours); (b) 15 semester hours of approved second-group courses in a related discipline or topical area; (c) AmCv 179–80, which must be taken in the senior year.

The major examination required of all seniors must be satisfactorily completed in the final year.

Special Honors will be awarded to students who fulfill the general requirements (see pages 50–51) and in addition (1) receive grades of A in at least half of their courses in the two areas of concentration and (2) receive honors in the major examination.

Two years of a foreign language or adequate preparation in statistics, logic, or linguistics is strongly recommended. Students should consult frequently with an American Civilization advisor.

Master of Arts in the field of American Civilization—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in American Civilization or in the subject in which concentration is contemplated.

Required: the general requirements, pages 91–99, including (1) AmCv 271–72 (six semester hours), a seminar on scope and method in American Civilization; (2) 18 additional semester hours in a carefully related pattern, focusing on a concentrated approach to the study of American Civilization; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major emphasis falls; (4) a Master's Comprehensive Examination reflecting the candidate's area of concentration. Special options in the degree program include the following:

1. *A concentration in Museum Training*—Course emphasis on substantive research in material culture under direction of staff at the Smithsonian Institution. Required: in addition to the general requirements outlined above, AmCv 250. Recommended, but not required: AmCv 352 (advanced research), AmCv

251 (internship), and other related courses offered by the Departments of Anthropology, Art, or Education.

2. *A concentration in Historic Preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: background in urban history. Required: in addition to the general requirements outlined above, AmCv 277–78. Recommended, but not required: additional courses in architectural history, urban and regional planning, and local history.

Master of Arts in the field of Museum Studies, see pages 397–99.

Doctor of Philosophy in the field of American Civilization—This program combines work in the humanities and/or social sciences as preparation for research and teaching, with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and/or social sciences as they apply to the understanding of American civilization.

Required: the general requirements, pages 91–94, 99–101. Candidates must pass a General Examination in four areas within three calendar years of matriculation. American cultural history is the only required field. Three other fields may be elected with approval of the advisory committee; one field must represent foreign coverage. Other areas may be chosen from the following groups: (1) American diplomatic, economic, political, social, or urban history; American literature, art, philosophy, or religion; Afro-American history; historic preservation; or some areas of the social and behavioral sciences; (2) in affiliation with the Library of Congress—supervised historical study in bibliographic resources including American history and politics, cartography, cross-cultural studies, government documents, graphic arts and music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution (Museum of History and Technology, National Portrait Gallery and National Collection of Fine Arts)—supervised studies including architectural history, decorative arts, ethno-history, historical archaeology, history of science, history of technology, industrial archaeology, material aspects of American civilization, and various fields in the history of art. Additional areas of study may be arranged within the University and in both the Library of Congress and Smithsonian cooperative programs. Special announcements concerning these programs are issued periodically and are available in the Office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

First Group

71–72 **Introduction to American Civilization** (3–3) Gillette, Mergen
Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance. (Academic year)

Second Group

103–4 **American Intellectual History** (3–3) Cunliffe
Same as Hist/Univ 103–4. Ideas, their exponents and their influence, relating to government and politics, religion, culture, personal and group behavior, and other topics. AmCv 103: from Jamestown to the Civil War. AmCv 104: since the Civil War. (Academic year)

115 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico and Central America. (Summer)

160-61-62 **Studies in American Literature** (3–3–3) Seavey, Romines, Sten
Same as Engl 160–61–62. Major factors in the national cultural tradition as shown by outstanding writers. (AmCv 160, 162—fall; 161—spring)

165 **Introduction to Folklore** (3) Staff
History of folklore studies in Europe and America; terminology and study of different folk genres. Same as Anth 165.

170 **The Culture of Sport and Leisure in America** (3) Mergen
Sport, ritual, and play, and relationships between these activities and American society. (Fall)

173 **Afro-American History** (3) Horton
Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as Hist 173. (Fall)

174 **Special Topics in Afro-American History** (3) Horton
Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as Hist 174. (Spring)

177 **Introduction to Historic Preservation** (3) Pearce
Washington, D.C. will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. (Summer)

179–80 **Proseminar in American Civilization** (3–3) Mondale
Coordinating course for seniors majoring in American Civilization. (Academic year)

184 **Contemporary American Civilization** (3) Staff
Examination of the patterns of contemporary American life through study of literature and the arts, and political, social, cultural, and economic trends.

185 **History of Women in America** (3) DePauw
Joint offering of the American Studies Program and the History Department. Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. (Fall)

186 **U.S. Urban History** (3) Gillette
Joint offering of the American Studies Program and the History Department. History of the American city from colonial foundations to the present, focusing on relationships between social and economic forces with physical form. Special emphasis on transitions from preindustrial to industrial to metropolitan forms, with attention to implications for public policy and historic preservation. (Spring)

192 **The American Cinema** (3) Kernan
Joint offering of the American Studies Program and the Speech and Drama Department. History and criticism of American films. The course will enable the student to recognize and evaluate cinema

techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. (Spring)

194 **Introduction to Historical Archaeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Fall)

195 **Independent Study** (3) Staff
Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Approval of advisor required. (Fall and spring)

197 **Oral History and Interview Techniques** (3) Gillette, Mergen
Joint offering of the American Studies Program and the History Department. Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. (Spring)

Third Group

215 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

225 **History of Washington, D.C.** (3) Gillette
The social history of Washington, from village to metropolis, with emphasis through field trips on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Same as Hist 225. (Summer)

257 **Seminar: Regional Folk Cultures** (3) Marshall
Research and discussion on the traditional cultures of various geographical regions of the United States. Theories of regionalism and their relation to the study of folklife and folklore will be considered. Different regions, such as the West, South, or the Chesapeake will be emphasized in different semesters. (Spring)

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary historical survey of women's work roles and labor force participation, including social prescriptions for and self-perceptions of women, market and technological factors affecting women's work choices, psychological responses to work roles, and familial organization of work duties. Differential attitudes and experiences by class, race, and ethnic groups. (Fall)

271–72 **Seminar: Scope and Methods in American Studies** (3–3) Mondale
Consideration of American studies as an area for research and teaching; introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American Civilization. (Academic year)

274 **Research Seminar: Materials in Afro-American Culture** (3) Horton

Joint offering of the American Studies Program and the History Department. Prerequisite: AmCv/Hist 173 and 174 or equivalent. (Spring)

276 **U.S. Architectural History** (3) Pearce

Joint offering of the American Studies Program and the Urban and Regional Planning Department. Basic stylistic developments in American architecture from the 17th through the 20th centuries, with special emphasis on the applicability of style recognition to buildings and neighborhoods in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

277–78 **Historic Preservation** (3–3) Pearce

Joint offering of the American Studies Program and the History and Urban and Regional Planning Departments. The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. (Academic year)

289–90 **Seminar: Topics in American Civilization** (3–3) Staff

Research problems selected by the instructor. Preparation in American cultural history or other area appropriate to the topic of the seminar. (Academic year)

295 **Independent Study** (arr.) Staff

Limited to master's candidates. Permission of instructor, in writing, required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

351 **Vernacular Architecture** (3) Upton

Examination of selected regional and ethnic traditions in American building. Survey and field techniques, comparative study of related types of objects, and use of documentary sources. (Spring)

379–80 **Readings in American Cultural History** (3–3) Walker

For students preparing for the Doctor of Philosophy general examination in the field of American Civilization. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE LIBRARY OF CONGRESS

The Graduate School of Arts and Sciences is affiliated with the Library of

Congress in a program leading to the degree of Doctor of Philosophy. The following courses are offered at the Library of Congress by members of its staff:

Third Group

255–56 **Research Orientation Seminar: Americana in the Library of Congress** (3–3) Walker

Examination of the collections of the Library of Congress with the aim of increasing understanding of American culture and awareness of library-oriented research problems and possibilities. For students in the affiliated doctoral program, this course may lead directly to a field in "Research Materials for the Study of American Life: Their Content, Collection, Arrangement, and Use." (Alternate academic years)

Fourth Group

355–56 **Practicum: Advanced Library Research** (3–3)

Practical problems in control of library materials with emphasis on collections in the Library of Congress. A reading field in the affiliated program. Prerequisite: AmCv 255–56. (Academic year)

389 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Library of Congress. May be repeated for credit. (Fall and spring)

390 **Dissertation Research** (arr.)

For Doctor of Philosophy candidates preparing dissertations based upon or significantly related to collections of the Library of Congress. Supervised by specialists at the Library. Prerequisite: AmCv 355–56. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the Museum of History and Technology and at the National Portrait Gallery, by members of their staffs:

Third Group

250 **Orientation Course: Material Aspects of American Civilization** (3) Washburn, Mergen

Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

251 **Museum Research and Education** (3) Washburn and Staff

Supervised work and/or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts, and photography as historical documentation. (Fall and spring)

252–53 **American Decorative Arts** (3–3) Carson

Concepts of visual recognition and evaluation of surviving domestic artifacts from the 17th, 18th, and 19th centuries, including those made of wood, clay, glass, metal, and cloth. AmCv 252 is prerequisite to AmCv 253. (Academic year)

254 **Seminar: Folklore in America** (3) Staff

Joint offering of the American Studies Program and the Anthropology Department. Various aspects of American traditional culture, including the theory and methodology of folklore research.

270 **Seminar: Museum Exhibiting** (3) Mahoney

Joint offering of the American Studies Program and the Anthropology Department. Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. (Fall)

284 **Seminar: Studies in American Art and History** (3) Miller

Joint offering of the American Studies Program and the Art Department. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit.

285 **Technology, Labor, and American Society** (3) Staff

Selected readings on the interrelations among technology, labor, and society in the United States, with special emphasis on the period 1750 to 1900.

294 **Field and Laboratory Research in Archaeology** (3) Cressey

Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

Fourth Group

352 **Research in Selected Aspects of American Civilization** (3)

Supervised study and/or field work in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)

394 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)

395 **Dissertation Research** (arr.)

For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under curatorial supervision at the Smithsonian Institution. Prerequisite: AmCv 351–52. May be repeated for credit. (Fall and spring)

ANATOMY—DOCTORAL PROGRAM

Professors F.D. Allan, T.N. Johnson, R.S. Snell *(Chairman)*, E.N. Albert, M.J. Koering
Associate Professors K.E. Johnson, F.J. Slaby
Assistant Professors J. Kerns, R.J. Walsh

Doctor of Philosophy in the field of Anatomy—Required: The general requirements, pages 91–94, 99–101. Candidates must also fulfill tool requirements by demonstrating proficiency in two of the following: a language (German, French, or Russian), biostatistics, computer science, or biological instrumentation. There will also be a comprehensive written and oral examination that will cover at least three areas of anatomical studies.

Research fields: cell ultrastructure, embryology, gross anatomy, histology, neuroanatomy, and physical anthropology.

Faculty approval is required for all courses.

Third Group

202 **Gross Anatomy** (6) — Snell and Staff
Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Embryology** (1) — Staff
Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) — T. Johnson
Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13.

205 **Human Microscopic Anatomy** (3) — Albert and Staff
Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) — Koering
Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) — T. Johnson
Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) — Allan
Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology (3)** (Same as Phyl 212) — Staff
An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221–22 **Seminar** (1–1) — K.E. Johnson
Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Staff
Variations in humans and factors affecting them; human evolution and racial differences; anatomy and culture of ancient humans. (Spring)

253 **Brain-Tissue Interactions** (1) Kerns, Walsh, Rosenstein*
Interactions of the CNS with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite: Idis 212. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee, $10. (Spring)

256 **Teratology** (1) Staff
Introduction to teratologic principles and techniques, with emphasis on experimental design. Limited enrollment.

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Transmission Electron Microscopy** (3) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Spring)

262 **Gross Anatomy of Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

* Jeffrey Mark Rosenstein is Assistant Professor of Anatomy at the GWU School of Medicine and Health Sciences.

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system, with clinical consideration. (Spring)

275 **Advanced Human Embryology** (1) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance. (Spring)

289 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
The application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANTHROPOLOGY

Professors R.K. Lewis, R.M. Krulfeld, R.L. Humphrey, Jr. *(Chairman)*, C.M. Turnbull
Professorial Lecturer J.L. Angel
Associate Professors V.K. Golla, S.L. Simons, A.S. Brooks
Associate Professorial Lecturers J. Mahoney, Jr., S. Hertz, M. Koch-Weser, G. Teleki, Jr., D. Von Endt, R.K. Evans
Assistant Professor C.J. Allen
Adjunct Assistant Professor C.R. Rose
Assistant Professorial Lecturers R.O. Selig, P.J. Cressey, K.M. Calavan, S.G. Frayser, P.S. Maloof, J.F. Santino
Adjunct Instructor J. Lanouette
Lecturer A.G. Webster

Bachelor of Arts with a major in anthropology (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite course—Anth 1–2.

3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introductory French, German, Russian, or Spanish (or another major language approved by the Anthropology Department); (b) six to twelve semester hours of course work in related departments. Recommended for ethnological emphasis are courses in economics, political science, psychology, and sociology; for archeological emphasis, courses in American civilization, art history, geography and regional science, geology, and history; for emphasis in physical anthropology, courses in anatomy and biological sciences. Courses in philosophy and statistics are strongly recommended for all anthropology majors.

4. Requirements for the major—24 to 36 semester hours in second-group anthropology courses, including Anth 101 and at least one course from each of the following four categories: aspects of culture (courses numbered in the 150s), linguistics (161, 168, or 169), ethnology (courses numbered in the 170s), and physical anthropology or archaeology (courses numbered in the 180s). Students intending to pursue a graduate degree in anthropology should take Anth 157 and at least one course each in archaeology and physical anthropology. Qualified seniors may enroll in 200-level courses with the permission of the instructor. Up to 6 semester hours of ethnographic or archaeological field school credit may be accepted and applied toward the major, if approved by the department, and majors are encouraged to participate in such summer programs. Opportunities also exist for field and laboratory research during the academic year, both within the department and elsewhere in the Washington area. Credit for such work (not to exceed 6 semester hours) may be granted through registration in Anth 195. Seniors in anthropology are urged to enroll in Anth 198, *Senior Seminar*; candidates for graduation with Special Honors must register in Anth 198 or for 3 semester hours of Anth 195, *Undergraduate Research*, and write a paper of special distinction arising out of a program of directed reading or research.

Bachelor of Arts with a major in classical archaeology and anthropology (departmental)—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Required courses in other areas: six semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible in their undergraduate programs.

3. Required courses in the major: Anth 180, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field-work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Minor in general anthropology—21 credit hours are required, including Anth 1–2, 101, and four additional semester courses in anthropology, no more than two of which may be taken in the same subdiscipline. (For the purposes of this minor the department's second-group courses may be divided into subdisciplines as follows: biological anthropology—Anth 186, 187, and 188; archeology—Anth 180, 182, 183, 184, 185, 190, and 194; anthropological linguistics—Anth 161, 168, and 169; socio-cultural anthropology—all other second-group courses, with the exception of Anth 195, 196, and 198, in which the topic is variable.)

Minor in archaeology—18 credit hours are required, including Anth 1 and 180; three courses chosen from Anth 182, 183, 184, 185, 190, and 194; an approved field or research course or a fourth course chosen from the preceding list.

Minor in biological anthropology—15 to 18 credit hours are required, including Anth 1, 186, 187, and 188; an approved field or research course or an approved course or course sequence in a related field (including biological sciences, geology, psychology, statistics, and certain other disciplines).

Minor in socio-cultural anthropology—18 credit hours are required, including Anth 2 and 101; one course in ethnography (Anth 170–179); Anth 151 or 152; Anth 156 or 157; one course chosen from Anth 150, 153, 155, 158, or 159.

Minor in cross-cultural communication—18 credit hours are required, including Anth 2, 161, 163; Anth 150 or 159; one course in ethnography (Anth 170–179); one course chosen from Anth 153, 155, 158, or 165. Psyc 115 is recommended.

Master of Arts in the field of anthropology—Prerequisite: a bachelor's degree; a major in anthropology is preferred. The undergraduate program should have included courses above the introductory level in anthropological theory, social organization, linguistics, archaeology, and physical anthropology. Students with less background in anthropology may be admitted, but may be required to take one or more undergraduate courses to make up deficiencies before beginning the degree program.

1. *General degree*—Required: the general requirements, pages 91–99. The minimum requirement consists of 24 semester hours of approved graduate course work, plus a thesis (equivalent to 6 semester hours). A thesis is preferred; under certain circumstances, however, the department may permit a program of study consisting of 36 semester hours of approved course work without a thesis. At least 6 semester hours drawn from the sequence Anth 201, 202, 203, 204 should be included in the program of study and should be completed during the first 24 semester hours of graduate course work. A reading knowledge examination in a major foreign language must be passed before beginning the third semester of graduate work. A tool course in statistics, computer programming, or a similar technical field may be substituted for the foreign language reading examination, if approved by the department. A written general Master's Comprehensive Examination must be passed before beginning the 28th semester hour of graduate work.

2. *With a concentration in museum training*—Required: the general requirements, pages 91–99. The program of study is the same as that described for the general degree, above, with the following exceptions: the minimum requirement consists of 36 semester hours of approved graduate course work, and must include from 12 to 15 semester hours of work in museum-related courses, 6 semester hours of which may be in an internship. In addition to the tool options described above, museum training students may substitute for the foreign language reading examination an appropriate course in chemistry or photography, if approved by the department. No thesis is required, but students are expected to submit to the department at least one research paper of publishable quality on a museum-related topic. Students whose primary interest is in museum techniques, rather than anthropology, are advised to apply to the Master's program in Museum Studies (pages 397–99).

Course accessibility: Anth 115, 152, 161, 165, 168, 169, 180, 182, and 185 may be taken without anthropology course prerequisites; Anth 1 is prerequisite to Anth 186, 187, and 188; Anth 1 or 180 is prerequisite to Anth 183–84; Anth 1

and 2 are prerequisite to Anth 101; Anth 2 or the permission of the instructor is required for all other second-group courses.

First Group

1–2 **Introductory Anthropology** (3–3) Staff

Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior. (Anth 1 and 2—fall and spring)

Second Group

101 **Survey of Anthropological Theory** (3) Allen, Krulfeld, Golla

The development of anthropological thought as seen in historical context. Exploration of selected basic concepts and theories of contemporary anthropology. (Fall)

115 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen

Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico and Central America. (Summer)

150 **Comparative Value Systems** (3) Krulfeld

World views, conceptual systems, and value orientations of representative cultures throughout the world.

151 **Primitive Economics** (3) Krulfeld

Comparative study of various economic organizations, including hunters and gatherers, herders, and cultivators. (Spring, odd years)

152 **Man, Culture, and Environment** (3) Humphrey

Basic principles of cultural ecology. Human interaction with the ecosystem both past and present; emphasis on the application of anthropological precepts to current environmental problems.

153 **Psychological Anthropology** (3) Simons

Relevance of psychological theories to human evolution and the cross-cultural study of personality. Cultural determinants of personality formation and mental health. (Spring)

155 **Anthropological Approaches to Religion** (3) Simons, Allen

Joint offering of the Anthropology and Religion Departments. Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change. (Spring)

156 **Comparative Political and Legal Systems** (3) Hertz, Simons

Cross-cultural study of ancient and modern systems of social control; moral, ethical, and legal factors which operate to produce behavioral norms. (Spring)

157 **Primitive Social Organization** (3) Simons, Hertz

Analysis of the social organization of primitive peoples; kinship, economic, and political systems. (Fall)

158 **Art and Culture** (3) Krulfeld, Humphrey, Allen

The art of tribal society, including the role of art in culture, in-

fluences upon the artist, and beliefs and practices associated with art production. (Fall)

159 **Symbolic Anthropology** (3) Allen
The study of culture through the analysis of symbolic systems including myth, cosmology, folklore, art, ritual, political symbolism, and the symbolic study of kinship. (Fall, odd years)

161 **Language and Culture** (3) Golla
Structure and semantics of systems of human communication; linguistic change; social aspects of language. (Fall)

163 **Anthropology of Visual Communication** (3) Calavan
Still and motion picture photography as an integral aspect of anthropological research. A study of recent and historic ethnographic films and an introduction to the forms and methods of making visual ethnographic records. Material fee, $15.

165 **Introduction to Folklore** (3) Santino, Zeitlin
History of folklore studies in Europe and America; terminology and study of different folk genres. Same as AmCv 165.

168 **Methods of Linguistic Analysis** (3) Golla
Phonetics, grammatical analysis, principles of lexicography, techniques of linguistic reconstruction, and other tools of anthropological linguistic research. (Fall)

169 **Intensive Study of a Language** (3) Golla
Analytic study of a selected language, ordinarily one not frequently studied in a university context, as an illustration of the methods of anthropological linguistics. Prerequisite: Anth 168. (Spring or summer)

170 **Cultures of the Caribbean** (3) Lewis
Culture history and ways of life among the area's various cultural groups up to the ethnographic present. (Spring, even years)

171 **Native Peoples of North America** (3) Simons, Humphrey
Comparative study of Indian groups representative of each of the continent's culture areas. (Fall)

172 **Cultures of South America** (3) Allen
Survey of native American, Iberian, and African populations of South America, and their interactions. (Fall)

173 **Cultures of the Pacific** (3) Lewis
Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. (Fall, even years)

175 **Topics in Asian and Circumpolar Ethnography** (3) Humphrey, Krulfeld, and Staff
Intensive, integrated study of a selected culture area in or around Asia (including Circumpolar regions). Specific area to be announced in the *Schedule of Classes*. May be repeated for credit.

177 **Cultures of the Near East** (3) Lewis
Geographic environment, language, religion, and social structure of settled and nomadic peoples of the Near East; emphasis on the Arab world. (Spring, odd years)

178 **Cultures of Africa** (3) Lewis, Hertz

Comparative examination of the history, cultural development, and contemporary problems of African cultures. (Fall, odd years)

180 **General Archaeology** (3) Humphrey, Brooks, Evans

Field and laboratory methodology in archaeology: stratigraphy, dating techniques, chronological systems and their implications; a brief survey of world prehistory.

182 **New World Archaeology** (3) Humphrey

Introduction to archaeological methodology, theory, and survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. (Spring)

183–84 **Old World Prehistory** (3–3) Brooks, Evans

Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations. Anth 183: Paleolithic and Mesolithic cultures. Anth 184: Neolithic and Bronze Age cultures. (Academic year)

185 **Latin American Archaeology** (3) Humphrey, Allen

Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Meso-America in odd years. May be repeated for credit.

186 **Physical Anthropology of Modern Man** (3) Angel

Individual and social biology, methods, and techniques. Genetic, cultural, and ecologic backgrounds of individual and population variation: micro-evolution, growth, paleodemography, paleopathology, forensic identification, techniques. (Spring)

187 **Introduction to Hominid Evolution** (3) Brooks

The fossil record of hominid evolution considered in the light of evolutionary theory. Brief review of the earlier human antecedents, with concentration on the Pleistocene remains. (Spring, odd years)

188 **Primatology** (3) Brooks, Teleki

Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Frequent meetings at the National Zoological Park. (Fall)

190 **Ethnohistory** (3) Allen, Humphrey

Joint offering of the Anthropology and History Departments. Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*.

194 **Introduction to Historical Archaeology** (3) Cressey

Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Undergraduate Research** (arr.) Staff

Individual research problems to be arranged with a member of the faculty. May be repeated for credit.

196 **Special Topics in Anthropology** (3) Staff

Courses offered by visiting faculty; experimental offerings. Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

198 **Senior Seminar** (3)

Study and discussion of selected major works in anthropology. Prerequisite: Anth 101 and senior standing in anthropology.

200 **Methods in Socio-Cultural Anthropology** (3) Krulfeld

Approaches to library and field research. Conceptual bases and biases in the delineation of problems and in the selection, analysis, and organization of data. Students will design and carry out their own field projects in the Washington area. (Spring)

Third Group

201 **Proseminar: Biological Anthropology** (3) Brooks

Theories, methods and current issues in the various subdisciplines of biological anthropology. (Spring)

202 **Proseminar: Socio-Cultural Anthropology** Krulfeld, Simons

Major topics in contemporary social and cultural anthropology, stressing current journal and monograph materials. (Spring)

203 **Proseminar: Anthropological Linguistics** (3) Golla

Contemporary anthropological studies of language in biological, social, and historical perspectives. (Fall)

204 **Proseminar: Method and Theory in Archaeology** (3) Humphrey, Brooks

Survey of the most recent archaeological techniques and theoretical approaches to reconstructing and interpreting the cultures of the past. (Fall)

211 **Seminar: Problems in Conservation** (3) Rose

Joint offering of the Anthropology and Art Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Von Endt

Joint offering of the Anthropology and Art Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of instructor. (Fall)

215 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen

Joint offering of the American Studies Program and the Department of Anthropology. Field study in Mexico and Central America. (Summer)

254 **Seminar: Folklore in America** (3) Mergen

Joint offering of the Anthropology Department and the American Studies Program. Various aspects of American traditional culture, including the theory and methodology of folklore research.

255–56 **Anthropology for Teachers** (4–4) Lanouette and Staff
Examination of current research, innovative classroom techniques and materials. Sessions with anthropologists at museums, laboratories, and zoos. Designed for middle and secondary school social science and science teachers. May not be taken for credit by M.A. candidates in anthropology.

258 **Seminar: Anthropology of Art, Aesthetics, and Symbolism** (3) Allen, Krulfeld
Anthropological approaches to aesthetic problems in the context of ethnographic materials.

260 **Seminar: Culture Theory** (3) Krulfeld, Allen
Contemporary theories of culture.

262 **Seminar: Applied Anthropology** (3) Lewis
Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)

263 **Seminar: Culture Contact and Change** (3) Simons
Change in Western and non-Western cultures; emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)

264 **Seminar: Anthropological Museum Techniques** (3) Humphrey
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research and instructional use of the museum. Field trips to area museums. (Fall)

266 **Seminar: Technology** (3) Humphrey, Lewis
Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)

267 **Seminar: Economic Anthropology** (3) Krulfeld
Comparative study of systems of production, distribution, and consumption. (Fall)

268 **Seminar: Peasant Society** (3) Krulfeld
Cross-cultural analysis of peasant societies, including their manner of functioning within their larger social, economic, and cultural context. (Fall)

269 **Seminar: Structural Problems** (3) Simons
Comparative survey of principles of descent, kinship terminology, and formation of descent groups; problems of variation and change in kinship systems and development of kinship models. (Spring)

270 **Seminar: Museum Exhibiting** (3) Mahoney
Joint offering of the Anthropology Department and the American Studies Program. Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. Taught at the Smithsonian Institution. (Fall)

272 **Seminar: Topics in Latin American Anthropology** (3) Allen, Koch-Weser

Specific topics, to be announced, will be selected from the following: mythology and ritual, artistic traditions, ethnic groups, Andean or Tropical Forest social organization, peasant movements and land reform, native cultures during the Colonial period, archeological problems.

273 **Seminar: Urban Anthropology** (3) Hertz

Anthropological investigations of city life from Neolithic beginnings to the present. Study of occupational, class, and ethnic communities within cities as well as ethnographies of entire cities. Adaptation of traditional field methods to urban settings. (Spring)

274 **Seminar: Topics in American Culture** (3) Hertz

Specific topic or topics to be announced in the *Schedule of Classes*. (Fall)

282 **Seminar: Advanced Archaeology—New World Prehistory** (3) Humphrey

Current archaeological problems relating to the origin and development of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.

283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archaeology** (3) Brooks

Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes*. (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff

Same as Econ/Geog/Hist/Rom 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Advanced Museum Research** (3) Staff

Supervised individual research and/or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)

291 **Anthropology in the Museum** (3) Evans

Anthropological materials (in the broadest sense), exhibits, and museums. Topics include: museum anthropology, collections, research, interpretation, and education, with a focus on the practical problems of developing an anthropological exhibit hall. (Spring)

292 **Introduction to Conservation** (3) Rose

Joint offering of the Anthropology and Art Departments. Method and theory of conservation, including fine arts, ethnographic, archaeological and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall class is only open to conservation students and those who will be registered for Anth 293 in the spring. The summer course deals with conservation of archeological materials. (Fall, spring, and summer)

293 **Conservation Laboratory Techniques** (3) Rose

Joint offering of the Anthropology and Art Departments. Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Prerequisite: Anth 292, Chem 13 or equivalent. Taught at the Smithsonian Conservation Laboratory. Admission by permission of instructor. (Spring)

294 **Field and Laboratory Research in Archaeology** (3) Cressey

Joint offering of the Anthropology Department and the American Studies Program. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording, photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

295 **Research** (arr.) Staff

May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

ART

Professors L.P. Leite *(Emeritus)*, F.S. Grubar, D.H. Teller, L.F. Robinson *(Chairman)*
Professorial Lecturers Grace Evans, D.A. Brown, L. Miller
Associate Professors H.I. Gates, J.L. Lake, J.F. Wright, Jr., A.H. Smith, T. Ozdogan
Adjunct Associate Professor Grose Evans
Associate Professorial Lecturers B.S. Glassman, A.D. Ullberg
Assistant Professors W.T. Woodward, F. Griffith, J.C. Anderson, D.M. Hitchcock, C.C. Costigan, B. Von Barghahn, S.B. Molina, M.P. Lader, E.R. Williams, J.L. Stephanic *(Visiting)*
Adjunct Assistant Professor C.R. Rose
Assistant Professorial Lecturers E.L. Battaglia, E.P. Lawson, K. Montgomery, J. Morrell, Jr., L. Smith, A.B. Barnhart, A.L. Glassman, C. Smigrod, G. Wartofsky, B.G. Carson, J.G. Kauffman, W.L. Lebovich
Lecturer E. Maroney
Curator, Dimock Gallery L.D. Miller

Bachelor of Arts with a major in art history (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. Prerequisite courses—Art 31–32 and 71 or 72.
3. Required courses in related areas—Art 137; Fren 1–2, 3–4, or Ger 1–2, 3–4; Phil 162; or equivalent.
4. Required courses in the major—Art 101 or 102, 104 or 105, 106 or 107, 108, 109, 110, 113 or 114, 117 or 118 or 119; nine additional semester hours in second-group art history courses.
5. A maximum of nine semester hours in Fine Arts, including Art 137, is permitted.

Graduation with Special Honors: Students must satisfy the general requirements (see pages 50-51). They should apply to the chairman of the department at the beginning of their senior year. Before admittance to the program, they must pass a reading examination in either French or German. Upon acceptance, candidates will be assigned to one or more faculty advisors under whose direction they will undertake a supervised program of study.

Bachelor of Arts with a major in Fine Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. A total of 54 hours of art courses is required of Fine Arts majors as stated below.
3. Required basic Fine Arts courses: Art 21–22 and 41–42.
4. Required courses in art history: Art 31–32; six additional semester hours in second-group art history courses.
5. Required Fine Arts courses in the major—30 semester hours of first- or second-group Fine Arts courses.
   A. 15 hours, exclusive of primary area of concentration, in five of the following eight areas—ceramics, advanced drawing, advanced design, graphics, painting, photography, sculpture, and visual communication.
   B. 15 hours to be taken in the primary area of concentration.
   C. Students concentrating in photography must take Art 23, 24, 181, 205, 206.
6. Six additional hours of electives may be taken in the Art Department.
7. Transfer students must take at least 12 semester hours of second-group Fine Arts courses.

Graduation with Special Honors: Students must satisfy the general requirements (see pages 50–51). They should apply in writing to the chairman of the Art Department at the beginning of their senior year. Upon acceptance, each candidate will be assigned one or more faculty advisors under whose direction a project in a special area of interest will be undertaken.

Bachelor of Arts with a major in classical archaeology and anthropology (departmental)—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to satisfy requirements.
2. Required courses in other areas: six semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archaeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible.
3. Required courses in the major: Anth 180, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field-work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Class 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Bachelor of Arts with a major in classical archaeology and classics (departmental)—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to be taken to satisfy the requirements.

2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.

3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110; 14 semester hours of second-group courses in Greek or Latin, including Clas 138. (A reading knowledge of French and German is recommended.)

Master of Arts in the field of art history—Prerequisite: a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archaeology, medieval art, Renaissance and Baroque art, contemporary art, and American art*—Required: the general requirements, pages 91–99; 36 hours of course work including six semester hours of thesis research. As many as possible of the 36 semester hours of course work should be in third-group courses; not more than six hours may be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. A written general Master's Comprehensive Examination must be passed before students can enroll for the six semester hours of thesis research. A written thesis must be submitted to and approved by the faculty.

2. *With a concentration in museum training*—Required: the general requirements, pages 91–99; 42 semester hours of course work as follows: 12 hours of art history courses, taken before acceptance into the museum program; Art 201–2 and 271–72, and 18 additional hours of art history courses selected in consultation with the advisor, not more than six hours to be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. Students are required to pass the general written Master's Comprehensive Examination in Art History and may also be required to pass a written comprehensive examination in Museology as part of the requirements for the internship.

Acceptance into this program as a degree candidate is provisional, pending satisfactory completion of 12 semester hours of graduate art history courses and the approval of the Graduate Programs Committee (Department of Art).

The Art Department has established a program of study in affiliation with a number of museums and galleries including the Corcoran Gallery of Art, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Collection of Fine Arts, the Phillips Collection, the Renwick Gallery, and the Textile Museum.

3. *With a concentration in museum administration*—For details consult the chairman of the department.

Master of Fine Arts in the field of ceramics, design, graphics, painting, photography, sculpture, or visual communication—Prerequisite: a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in Fine Arts in the field of ceramics, design, drawing, graphics, painting, photography, sculpture or visual communication. A 3.00 undergraduate grade-point average (on a 4.00 scale) and departmental approval of the applicant's work is required. This should consist of slides of at least 10 drawings, including figure studies, and four to six paintings, prints, sculptures, ceramics, or photographs. Students planning to do graduate work in graphics or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements, pages 91–99. As a tool requirement Master of Fine Arts candidates must take Art 137 or three additional hours of course work selected in consultation with the advisor. As many as possible of the remaining 24 hours of course work should be in third-group courses, only 18 hours of which may be in one area; the remaining six hours are to be

selected from related areas in consultation with the advisor. A creative thesis consisting of the execution of original works of art in ceramics, design, graphics, painting, photography, or sculpture will be completed under the supervision of a thesis advisor. In addition, the thesis must include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader.

Doctor of Philosophy in the field of art history—Required: the general requirements, pages 91–94, 99–101, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German, a General Examination in art history, an examination in the area of specialization, and examinations in two areas related to the area of specialization. Students plan their own programs in consultation with a departmental committee.

Areas of Specialization: classical art and archeology, Medieval art, Renaissance art, Baroque art, eighteenth-century art, nineteenth-century art, twentieth-century art, and American art.

Bachelor of Arts in Education and Human Development with a teaching field in art—Prerequisite: the education curriculum, pages 114–15.
Required: the art option and professional courses listed on page 118.

ART HISTORY

First Group

1 **Principles of Art** (3) Von Barghahn
An introduction to various art media, basic elements of art and thematic interpretations, European and non-Western traditions. (Fall and spring)

31–32 **Survey of Western Art** (3–3) Robinson and Staff
A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to modern art. (Art 31 and 32—fall and spring)

71–72 **Introduction to the Arts in America** (3–3) Grubar and Staff
Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

Second Group

101 **Greek Art and Archaeology** (3) Williams
(Fall)

102 **Roman Art and Archaeology** (3) Williams
(Spring)

103 **The Ancient Artist and His Workshop** (3) Williams

104 **Renaissance Art in Italy I** (3) Grace Evans
Early developments from the 13th to the 15th century. (Fall)

105 **Renaissance Art in Italy II** (3) Grace Evans
High Renaissance and Mannerism. (Spring)

106 **Renaissance Art in the North I** (3) Hitchcock
Northern painting from van Eyck through the Antwerp Mannerists. (Fall)

107 **Renaissance Art in the North II** (3) Hitchcock
Northern painting and graphics from Dürer through Brueghel. (Spring)

108 **18th-Century Art in Europe** (3) Hitchcock
(Spring)

109 **19th-Century Art in Europe** (3) Robinson
(Fall and spring)

110 **Contemporary Art** (3) Lader
(Fall and spring)

111 **Classical Archaeology** (3) Williams
Archaeological monuments of classical civilizations, with intensive study of one or more areas selected from architecture, sculpture, painting, or minor arts.

112 **Egypt and the Ancient Civilizations** (3) Williams
Study of the art of Mesopotamia, Anatolia, Egypt, and Persia.

113 **Baroque Art in Italy** (3) Grose Evans
(Spring)

114 **Baroque Art in the North** (3) Hitchcock
Holland, Flanders, Spain, France, Germany, and England. (Fall)

115 **Christian Iconography** (3) Anderson
Origins and development of Christian symbols and themes from early Christian to modern times.

116 **Islamic Art** (3) Staff

117 **Medieval Art I** (3) Anderson
Early Christian and Byzantine. (Fall)

118 **Medieval Art II** (3) Anderson
Romanesque and Gothic. (Spring)

119 **Pre-Romanesque Art in the North** (3) Anderson
Merovingian and Carolingian. (Spring)

120 **East Asian Art** (3) Staff
(Fall)

121 **Spanish Art I** (3) Von Barghahn
Discussion of areas selected from the art of ancient Iberia through the seventeenth century. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

122 **Spanish Art II** (3) Von Barghahn
Discussion of areas selected from the eighteenth through twentieth centuries. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit provided the content differs.

129–30 **Principles of Museum Work** (3–3) Lawson
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service. (Academic year)

140 **Gothic Architecture** (3) Staff

145 **Folk Arts in America** (3) Grubar
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

147 **Primitive Art I: Ancient Civilizations of Mexico and Latin America** (3) Von Barghahn
(Formerly Pre-Columbian Art)
Survey of Pre-Columbian art and architecture from prehistoric period to the Spanish conquest, inclusive of Yucatan and Central American regions.

148 **19th-Century American Painting** (3) Grubar
(Fall)

149 **19th-Century American Sculpture** (3) Grubar
(Spring)

150 **Landmarks in American Art** (3) Grubar

155 **The Aegean Civilizations** (3) Williams

156 **Early Medieval Sculpture** (3) Grace Evans

161 **Studies in Renaissance Art** (3) Grace Evans

162 **The Art of Oriental Rugs** (3) Staff

165 **Primitive Art II: African, Oceanic, North American Indian** (3) Von Barghahn
(Formerly African Art)
Survey of architecture, sculpture, and painting from ancient kingdoms to early 20th-century culture. Emphasis upon imagery and iconography.

167 **French Painting: 15th and 16th Centuries** (3) Von Barghahn

169–70 **History of Decorative Arts** (3–3) Carson
(Academic year)

173 **History of the Cinema** (3) Staff
Joint offering of the Art and Speech and Drama Departments. An examination of motion picture history in terms of socially structured narrative from Griffith to Godard. (Spring)

Third Group

201–2 **Museum Projects** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the field of museum training.

203 **Primitive Art** (3) Staff
(Spring)

207 **Modern Architecture** (3) Lader
Europe and America. (Fall)

211 **Seminar: Problems in Conservation** (3) Rose
Joint offering of the Art and Anthropology Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Staff
Joint offering of the Art and Anthropology Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall)

213 **Museum Administration and Government** (3) Staff

214 **Museum Administration and Trusteeship** (3) Staff

216 **Medieval Painting** (3) Grace Evans
Painting and the decorative arts.

217–18 **Problems in Museum Work** (3–3) Ullberg
Art 217 is prerequisite to Art 218.

*220 **Seminar: Baroque Art of the 17th Century** (3) Hitchcock
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)

*221 **Seminar: Renaissance Art** (3) Staff
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)

*†243 **Seminar: American Art** (3) Grubar
(Fall and spring)

*†244 **Seminar: 19th-Century European Art** (3) Robinson
Reading knowledge of French desirable.

*†245 **Seminar: 20th-Century European Art** (3) Lader

*246 **Seminar: Classical Art** (3) Williams

*247 **Pro-Seminar: Medieval Art and Archaeology** (3) Anderson

248 **Independent Research in Art History** (3)
(Fall and spring)

261 **Seminar: Problems in Art History** (3) Staff
Recommended for art history majors; open to limited number of qualified undergraduates, with permission of instructor. Theory, criticism, or methodology of art history. May be repeated for credit. Topic to be announced in *Schedule of Classes*. (Fall and spring)

* Specific area announced in the *Schedule of Classes*. May be repeated for credit if the specific area covered is different.
† Laboratory fee, $15 when course is taught off campus.

271–72 **Museum Techniques** (3–3) Staff

Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)

284 **Seminar: Studies in American Art and History** (3) Staff

Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smithsonian Institution. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)

289–90 **Thesis Research** (3–3) Staff

(Fall and spring)

292 **Introduction to Conservation** (3) Rose

Interdepartmental course offered by the Art and Anthropology Departments. Method and theory of conservation, including fine arts, ethnographic, archeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall section is open to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

293 **Conservation Laboratory Techniques** (3) Rose

Interdepartmental course offered by the Art and Anthropology Departments. Discussion (2 hours), laboratory (8 hours). Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Taught at the Smithsonian Conservation Laboratory. Prerequisite: Art or Anth 292, Chem 13. (Spring)

Fourth Group

Limited to art history doctoral candidates. Offered as the demand requires.

*385–86 **Readings in Art History** (3–3)

*398 **Advanced Reading and Research** (arr.)

For students preparing for the doctoral examination.

*399 **Dissertation Research** (arr.)

FINE ARTS

Departmental prerequisite: Art 21–22 and 41–42 (students concentrating in photography substitute Art 23 and 24 for 41–42).

First Group

21–22 **Design I: Basic** (3–3) Costigan, Teller

Required of all Fine Arts majors. Fundamental studies of principles

* May be repeated for credit.

and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. Art 21: Laboratory fee, $15. Art 22: Laboratory fee, $21. (Art 21 and 22—fall and spring)

23 **Introduction to Photography** (3) Lake and Staff

Introduction to the principles of exposure and development of films and papers. Emphasis on creative expression. Laboratory fee, $42. (Academic year)

24 **Fundamentals of Photography** (3) Lake and Staff

Film developers; types and effects on films. Emphasis on control for creative expression. Prerequisite: Art 23. Laboratory fee, $42. (Academic year)

41–42 **Drawing I** (3–3) Wright and Staff

Elementary investigation of concepts of drawing, both traditional and contemporary; training in perception, analysis of form in light and space; instruction in the use of graphic materials and media; exercises in connoisseurship. Material fee, $24 per semester. (Art 41 and 42—fall and spring)

51 **Introduction to Handbuilt Ceramics** (3) Ozdogan, Smith

Working with clay as an art form. Exploration of pinch, coil, slab, hump and press mold, paddling and hollowing techniques. Sketch studies, reduction and oxidation kiln-firings, clay and glaze making. Laboratory fee, $54.* (Fall and spring)

52 **Introduction to Wheelthrown Ceramics** (3) Ozdogan and Staff

Development of cylindrical and open forms. Trimming, clay and glaze making, reduction and oxidation kiln firings. Sketch studies. Laboratory fee, $54.* (Fall and spring)

57–58 **Graphics I** (3–3) Griffith, Wright

Exploration of the methods of intaglio, relief, printing, and other composite processes. Material fee, $21 per semester. (Academic year)

61–62 **Water Color** (3–3) Staff

Painting in transparent and opaque water color and in acrylic. Experimentation, figurative and landscape. (Academic year)

65–66 **Painting I** (3–3) Smith and Staff

Emphasis on personal expression with exposure to a variety of styles. Application of design principles to easel painting. Prerequisites: Art 21, 41. Material fee, $15 per semester. (Academic year)

81–82 **Sculpture I** (3–3) Gates and Staff

Three-dimensional design. Basic sculptural techniques; modeling, carving, and construction. Media include wood, clay, stone, plaster. Laboratory fee, $24 per semester. (Academic year)

Second Group

Second-group art courses may be repeated for credit with approval of the department.

123–24 **Individual Problems** (3–3) Staff

Emphasis on problems and materials of specific interest to the stu-

* Laboratory fee in all ceramics courses includes unlimited materials and tools.

dent in any area of Fine Arts. Laboratory fee depending on area chosen.* Prerequisite permission of instructor. (Academic year)

125–26 **Painting II** (3–3) Smith

Alteration of personal expression and structured problems dealing with still-life and the figure. Use of acrylic and oil. Material fee, $15 per semester. (Academic year)

127–28 **Painting III** (3–3) Woodward

Studies in the interpretation of the figure and still-life. Emphasis on color, space, planes, modulations. Alla prima and mixed techniques. Material fee, $15 per semester. (Academic year)

131 **Intermediate Ceramics: Wheelthrown Functional Forms** (3) Ozdogan and Staff

Aesthetic and technical development of wheelthrown functional ceramic forms. Exploration of attachments: lids, spouts, handles, and footing devices. Sketches and technical drawings, clay and glaze-making tests, varied temperature firings in reduction and oxidation atmospheres. Laboratory fee, $54.† (Fall and spring)

132 **Intermediate Ceramics: Wheelthrown Non-functional Forms** (3) Ozdogan and Staff

Aesthetic and technical development of thrown ceramic sculptural forms. Emphasis on section throwing, closed forms, and construction. Varied temperature firings in oxidation and reduction atmospheres. Clay and glaze making. Laboratory fee, $54.† (Fall and spring)

133 **Ceramic Decoration** (3) Ozdogan

Aesthetic and technical development of surface decoration, with experimental projects in sgraffito, mishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee, $54.† (Fall)

134 **History of Photography** (3) Staff

(Spring)

135–36 **Advanced Water Color** (3–3)

Development of techniques of water color; concentration on special projects. (Academic year)

137 **Workshop in Materials, Methods, and Techniques** (3) Woodward, Smith, and Staff

Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, $15. (Fall and spring)

138 **Graphics: History and Practice** (3) Griffith

Laboratory fee, $21.

139 **Design in Fiber** (3) Costigan

Emphasis on individual expression in two- and three-dimensional fiber works, with exposure to a variety of styles, attitudes, and materials. Prerequisite: Art 21–22 or permission of instructor. Laboratory fee, $9.

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* *Schedule of Fees:* Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$24; Graphics—$21; Sculpture—$24; Typography—$30; Painting—none; Photography—$42; Visual Communication—$30.

† Laboratory fee in all ceramics courses includes unlimited materials and tools.

141 **Interior Design** (3) Teller and Staff

142 **House Planning** (3) Staff

143–44 **Serigraphy** (3–3) Teller

Fine Arts printmaking using serigraphic techniques. Utilization of all basic techniques; emphasis on aesthetic properties of prints. Prerequisite: Art 21 and 41–42. Laboratory fee, $21 per semester. (Academic year)

146 **Ceramic Restoration** (3) Ozdogan

Methods and techniques for museum and commercial application. Laboratory fee, $21. (Summer)

151 **Ceramic History and Technology** (3) Ozdogan and Staff

A survey of the history of ceramics and its technology. Lectures, demonstrations and supplemental programs. (Fall)

152 **Ceramic Sculpture** (3) Ozdogan, Smith

Developing an understanding of the sculptural ceramic form which integrates both quality and creativity. Techniques in hollow and solid construction. Varied temperature firings in reduction and oxidation kilns. Laboratory fee, $54.* (Fall)

153–54 **Graphics II** (3–3) Griffith, Wright

Advanced relief, intaglio, and other composite processes. Prerequisite: Art 57–58. Material fee, $21 per semester. (Academic year)

157–58 **Graphics III** (3–3) Griffith

Exploration of combined techniques and mixed media. Prerequisite: Art 153–54. Material fee, $21 per semester. (Academic year)

159–60 **Drawing II** (3–3) Wright and Staff

Study and application of master drawing techniques. Investigation of perspective and anatomy. Emphasis upon conceptual development of personal style. Prerequisite: Art 41–42. Material fee, $24 per semester. (Academic year)

163–64 **Visual Communication I** (3–3) Molina and Staff

Layouts and execution in client-presentation form of various graphic design projects—brochures, bookjackets, displays, title graphics for film media. Material fee, $21 per semester. (Academic year)

166 **Advanced Drawing Techniques** (3) Smith and Staff

Specific area announced in the *Schedule of Classes*. May be repeated for credit if the area covered is different. Prerequisite: Art 41–42. Laboratory fee, $21.

171 **Typography I** (3) Molina and Staff

Techniques of hand lettering, traditional and contemporary. Exploration of the decorative potential in lettering. Material fee, $21. (Fall)

172 **Typography II** (3) Molina

Study of type classification, recognition, and adaption. Methods of copy fitting and type reproduction processes. Typographic layout and specification. Material fee, $21. (Spring)

* Laboratory fee in all ceramics courses includes unlimited materials and tools.

174 **Visual Communication II** (3) Molina
Limited to seniors. Material fee, $21.

175 **Lithography** (3) Staff
May be repeated for credit if the area covered is different. Material fee, $21.

177–78 **Survey of Printing and Illustration** (3–3) Staff
Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typographic proofs for commercial reproduction. (Academic year)

179–80 **Sculpture II** (3–3) Gates
Creation of three-dimensional forms using combination of techniques: wood, steel, plastic, and plaster. Prerequisite: Art 81–82. Laboratory fee, $24 per semester. (Academic year)

181 **Introduction to Color Photography** (3) Lake
Use of filters for creating and correcting color shifts with emphasis on color as subject matter. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $42. (Fall)

182 **Intermediate Photography** (3) Lake
Filters and their use with black-and-white film as means of tone control. Emphasis on creative expression. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $42. (Spring)

183 **Intermediate Black and White Photography** (3)
Emphasis on role of ideas in black and white photography. Critiques designed to encourage development of an individual style. Prerequisite: Art 23 and 24 or permission of instructor. Laboratory fee, $36. (Fall and spring)

185–86 **Painting and Drawing** (3–3)
Techniques of drawing and painting in oil, acrylic, and water color. Work from life model and still life. Material fee, $15 per semester.

189–90 **Sculpture III** (3–3) Gates
Advanced study in concepts and materials through creation of three-dimensional forms concentrating on relevance of scale and media. Relationship of sculpture to the environment. Prerequisite: Art 179–80. Laboratory fee, $24 per semester. (Academic year)

193–94 **Film Making** (3–3)
Basic techniques and procedures in film making. Each student will create a short film. Art 193 is prerequisite to Art 194. (Academic year)

195 **Documentary Photography** (3) Battaglia
Joint offering of the Art and Journalism Departments. Historical development of documentary photography. Completion of two projects required. Laboratory fee, $42. Prerequisite: Art 23 and 24 or permission of instructor. (Fall)

197–98 **History of Photography** (3–3)
Discussion of major figures and movements in the history of photography.

Third Group

All third-group art courses may be repeated for credit with the approval of the department.

205 **Advanced Photography: Zone System Tests** (3) Lake
Tone control through exposure development tests. Completion of laboratory manual required. Prerequisite: Art 181 and 182 or permission of instructor. Laboratory fee, $42. (Fall and spring)

206 **Photography: Special Projects** (3) Lake and Staff
Prerequisite: Art 181 and 182 or permission of instructor. Laboratory fee, $42. May be repeated for credit.

208 **Advanced Photography** (3)
Advanced problems in photography; emphasis on individual development. Prerequisite: Art 181 and 182 or permission of instructor. Laboratory fee, $36. (Fall and spring)

209–10 **Exhibition and Display Design** (3–3) Miller

224 **Advanced Ceramic Sculpture** (3) Ozdogan
Continuation of Art 152 with emphasis on individual approach. Exploration of mixed media and mold casting. Laboratory fee, $54. (Fall)

225 **Advanced Ceramic Decoration** (3) Ozdogan, Smith
Perfection of decorating techniques. Students establish style through independent exploration. Laboratory fee, $54. (Spring)

226 **Architectural Ceramics** (3) Ozdogan
Advanced studies in ceramic murals and sculpture oriented toward indoor and outdoor architectural concepts. Laboratory tests and activities. Laboratory fee, $54. (Spring)

231–32 **Design III** (3–3) Gates
New media and techniques in three-dimensional design. Laboratory fee, $24 per semester. (Academic year)

234 **Design IV** (3) Staff
Specifications and fabrication of materials in three-dimensional presentation. (Fall and spring)

235 **Design V: Textile Printing** (3) Teller
Designing and executing textiles using the techniques of silk screen, block print, and batik. Laboratory fee, $21. (Fall and spring)

248 **Independent Research in Fine Arts** (3)
For master's degree candidates; open to limited number of qualified undergraduates, with permission. Independent research arranged in consultation with individual instructor and graduate advisor. May be repeated for credit. Laboratory fee depending on area chosen.* (Fall and spring)

249 **Theory of Design** (3) Costigan
Application of design principles to problems of the artist in all disci-

* Schedule of Fees: Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$21; Graphics—$21; Sculpture—$24; Typography—$30; Painting—none; Photography—$42; Visual Communication—$30; Serigraphic Techniques—$21.

plines. Emphasis on individual creativity, presentation, and criticism. Guest lectures on issues in contemporary art. Open to all MFA candidates and to seniors with permission of instructor. Laboratory fee, $9.

251 **Advanced Ceramic Design in Wheel Throwing** (3) Ozdogan
Individual projects on the potter's wheel. Student establishes personal style and direction, and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays, glazes, and firings is required. Laboratory fee, $54. (Fall and spring)

252 **Advanced Ceramic Design in Hand Building** (3) Ozdogan
Individual projects in hand building. Student establishes style and direction, and perfects skills. Either pottery or sculptural approaches encouraged. Research in clays and glazes is required. Laboratory fee, $54. (Fall and spring)

253 **Industrial Ceramic Design/Mold Making** (3) Ozdogan
Study in the multiple production process from model making to finished duplicate form as it exists on factory level. Methods include all aspects of model designing and making in clay and plaster; mold making in plaster; production methods from molds including press molding, slip-casting, jiggering, and jollying. Laboratory fee, $54. (Fall and spring)

254 **Ceramic Glazes: Calculation and Formulation** (3) Glassman
Laboratory fee, $21.

255–56 **Graphics IV: Advanced Serigraphy** (3–3) Teller
Utilization of principles and techniques of serigraphy toward development of personal statement and style. Prerequisite: Art 143–44. Laboratory fee, $21 per semester. (Academic year)

257–58 **Graphics V: Etching and Engraving** (3–3) Griffith
Prerequisite: Art 157–58. Material fee, $21 per semester. (Academic year)

259 **Graphics VI: Lithography** (3) Wright
Material fee, $21. (Fall and spring)

260 **Graphics VII: Relief Printing** (3) Griffith
Material fee, $21. (Fall and spring)

265–66 **Painting IV** (3–3) Woodward
Alternatives in pictorial dynamics. Assigned studio and independent problems in alla prima and mixed techniques. Material and model fee, $15 per semester. (Academic year)

267–68 **Individual Problems in Photography** (3–3) Lake and Staff
Limited to MFA candidates and qualified undergraduates. Prerequisite: Permission of instructor and approval of project prior to registration. May be repeated for credit. Laboratory fee, $36 per semester. (Academic year)

275 **Painting V** (3) Woodward
Development of personal imagery. Individual problems and critiques. Material and model fee, $15.

277–78 **Advanced Visual Communication** (3–3) Molina
Design and execution of graphic design projects, including magazine spreads, posters, advertisements, trademarks, letterheads, packages,

Psychological and symbolic aspects of design solutions. Laboratory fee, $30 per semester. (Academic year)

279–80 **Sculpture IV** (3–3) Gates

Advanced study aimed at development of concept and style. Prerequisite: permission of instructor. Laboratory fee, $24. (Academic year)

281 **Sculpture V** (3) Gates

Emphasis on individual sculptural concepts and materials. Prerequisite: permission of instructor. Laboratory fee, $24. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

Laboratory fee depending on area chosen.* (Fall and spring)

ART THERAPY—GRADUATE PROGRAM

Professors B.I. Levy *(Program Director)*, D.E. Silber *(Associate Director)*
Adjunct *Associate Professors* E. Ulman *(Coordinator of Training)*, E. Kramer, J. Krash
Assistant *Professor* A.R. Bruhn *(Assistant Director)*
Adjunct *Assistant Professors* W. Maiorana, M. Fleming, P.A. Rossiter-Ravenscroft, K.J. Williams
Lecturer A.J. Evans
Clinical *Instructors* B.J. Clifford, S. Fishman, G. Haugan, M.S. Schmal

Master *of Arts in the field of art therapy*—Prerequisite: a bachelor's degree, evidence of significant training and/or experience in art, including painting, drawing, and clay modeling; course work in the behavioral and/or social sciences, including personality theory, abnormal psychology, and child psychology.

Required: the general requirements, pages 91–99. Prospective candidates should consult the brochure which describes the program for specific requirements.

Fields *of emphasis:* adult art therapy, family art therapy, child art therapy, and research.

201 **Introduction to Art Therapy** (3) Ulman

Lectures, presentation of illustrative case material, class discussion of assigned readings, field work. Survey covering range of art therapy practice, personality assessment and treatment approaches, historical development, main theoretical trends. Open only to art therapy degree candidates. (Fall)

202 **Case Studies in Art Therapy** (3) Ulman

Discussion of case material provided by students in order to refine methods of working, improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

203 **Technique of Art Therapy** (3) Williams

Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous tech-

*Schedule of Fees: Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$21; Graphics—; Sculpture—$24; Typography—$30; Painting—none; Photography—$42; Visual Communication—; Serigraphy—$21.

niques through the use of art materials. Open only to art therapy degree candidates. (Fall)

204 **The Freudian Model in Art Therapy** (3) Kramer, Ulman
Concepts of instinctual drives; ego development; mechanisms of defense; sublimation; transference and countertransference; maturation and regression applied to work with children, adults, families, and groups. (Spring)

205–6 **Family Art Techniques** (3–3) Rossiter-Ravencroft
Principles of work with families, with emphasis on the use of art techniques for evaluation of family dynamics. The major focus is on opportunities to conduct and observe family art evaluations. Enrollment is limited to 12. Prerequisite: ArTh 201, 203. Open to art therapy degree candidates only. (Fall and spring)

207 **Art as Therapy with Children** (3) Maiorana
Introduction to the practical and theoretical considerations involved in art as therapy with children. Focus on psychodynamics, artistic developmental stages, methods of child art evaluation, and basic issues in therapeutic guidance of the child. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Fall)

208 **Art Therapy with Adolescents** (3) Fleming
Theoretical and practical issues in art therapy with adolescents in educational and clinical settings. Experiential work in art techniques appropriate to this population. Class discussion of readings on adolescent development. Prerequisite: ArTh 201, 203; open to others with permission of instructor. (Spring)

211 **Survey of Art Therapy** (3) Maiorana, Williams, Evans
Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. For students not intending to specialize in art therapy. Open to advanced undergraduates with permission of instructor. (Fall and spring)

218 **Seminar: Systems of Psychotherapy** (3) Silber
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Spring)

220 **Process of Art Therapy** (6) Maiorana, Williams
(Formerly 3 credits)
Exploration of the treatment process. Students discuss literature from art therapy and related fields and rehearse fundamental ways of being an art therapist through videotaped role-playing. Designed to increase students' ability to evaluate their own therapeutic effectiveness. Prerequisites: ArTh 201, 203; open to others with permission of instructor. (Spring)

275 **Group Art Therapy** (3) Williams
Experience as participant, observer, and leader in an art-centered group; required reading; theory of group process. Open to art therapy master's degree candidates and others with permission of instructor. (Summer)

283–84 **Practicum in Art Therapy** (3–3) Staff

Minimum of 300 hours field work per semester connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff and from peers. Prerequisite: ArTh 201 and 203, or 211. Open only to art therapy degree candidates.

285 **Special Projects in Art Therapy** (3) Staff

Individual work based on study, research, or practice. Details to be worked out with each student. Resource people may be called upon to assist, as appropriate. May be repeated for credit with approval of advisor. (Fall and spring)

289 **Special Topics in Art Therapy** (3) Staff

Connection between art therapy and other disciplines; new developments in the field. May be repeated for credit with approval of advisor. Open to art therapy degree candidates and others with permission of instructor.

290 **Workshops in Art Therapy** (3) Staff

Art therapists and other mental health professionals will conduct four weekend workshops during each semester. Emphasis on the elucidation of concepts of treatment through lectures, discussion, and participation. Students registered in the art therapy program aid in the selection of subjects and leaders. (Fall)

ASTRONOMY

See **Physics.**

BIOCHEMISTRY—GRADUATE PROGRAMS

Professors B.W. Smith, G.V. Vahouny, J.M. Bailey, A.L. Goldstein *(Chairman)*, C.R. Treadwell *(Emeritus)*
Associate Professors G.A. Walker, L.L. Gallo, A. Kumar
Assistant Professor T. Moody

Master of Science in the field of biochemistry—Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Phys 1, 2. Required: the general requirements, pages 91–99, including Bioc 221–22, 225–26, 229, 299–300; Chem 251. The remaining courses are to be selected from Bioc 231, 232, 240, 250, 260, 270. It is expected that students will complete all of the required work in approximately two years.

Doctor of Philosophy in the field of biochemistry—Required: the general requirements, pages 91–94, 99–101.

Research fields: endocrinology—thymosin, steroid hormones, prostaglandins; immunology—immuno-chemistry, thymosin peptides; molecular biology—RNA metabolism, protein synthesis, gene transfer; lipid chemistry and metabolism—essential fatty acids, lipoproteins, complex lipids, cholesterol, peroxides, atherosclerosis, steroidogenesis; nutrition—dietary fiber, dietary fat, trace minerals; neurochemistry—endorphins, enkephalins, nerve growth factors, bombesis; protein chemistry; B_{12} coenzymology.

221-22 **General Biochemistry** (3–4) Gallo and Staff

A comprehensive course in general biochemistry for graduate stu-

dents in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

225–26 **Introduction to Biochemical Research** (arr.) Smith and Staff
Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used in those units. Limited to students in the Department of Biochemistry graduate program. (Academic year)

227 **Biochemistry Seminar** (1) Bryant* and VanderMaten†
Current literature in biochemistry. Open to graduate students in the biomedical sciences and to a limited number of medical students. May be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (2) E. Anderson‡
(Formerly 1 credit)
Content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 201 or 221. (Spring)

230 **Current Topics in Enzymology** (2) Bailey and Staff
Directed readings in various areas of enzymology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 229.

231 **Bioenergetics** (2) Staff
Content includes laws of thermodynamics, application of these laws to biological systems; oxidation—reduction processes and other special topics. Prerequisite: Bioc 221–22. (Fall)

232 **Protein Chemistry** (2) Steers§ and Schechter§§
(Formerly Bioc 232 and 233, 1 credit each)
Content includes the theory and methods of protein chemistry, the structure-function relationship of proteins and other special topics. Prerequisite: Bioc 201 or 221. (Fall)

240 **Nutrition** (2) Walker and Staff
Content includes discussion of RDA, nitrogen-balance, vitamins and minerals, diets and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

241 **Current Topics in Nutrition** (2) Walker and Staff
(Formerly Isotopes)
Directed readings in various areas of nutrition. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 240.

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* Robert Wesley Bryant is Assistant Research Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.
† Mary Ann VanderMaten is Assistant Research Professor of Biochemistry in the G.W.U. School of Medicine and Health Sciences.
‡ Elizabeth Potts Anderson is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
§ Edward Steers, Jr., is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.
§§ Alan Neil Schechter is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.

250 **Cell and Molecular Biology** (2) Kumar and Staff

Content includes the organization and replication of genetic material, transcriptional and translational machinery, regulation of eukaryotic gene expression and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

251 **Current Topics in Molecular Biology** (2) Kumar and Staff

Directed readings in the area of molecular biology. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 250.

252 **Biochemical and Molecular Aspects of Selected Diseases** (2) Irwin* and Staff

(Formerly Biochemistry of Nervous Tissue Function)

Emphasis on the biochemical and molecular aspects of selected major diseases. The format will be of a tutorial type, including presentations of material by students. (Spring)

256 **Biochemical Genetics and Inherited Metabolic Diseases** (1 or 2) Merril

(Formerly Biochemistry of Organ Function)

Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. Prerequisite: Bioc 250. (Spring)

260 **Lipids** (2) Gallo and Vanderhoek†

Content includes the biosynthesis, metabolism, and functions of lipoproteins, prostaglandins, and other special topics. Prerequisite: Bioc 221–22. (Spring)

261 **Current Topics in Lipids** (2) Vahouny and Staff

Directed readings in the area of lipid biochemistry. May be repeated for credit. Enrollment limited to graduate students in biochemistry. Prerequisite: Bioc 260.

263 **Steroids** (2) Dodek‡

For medical students; open to a limited number of graduate students. Content includes chemistry of steroid pathways of biosynthesis and metabolism, clinical manifestations of steroid unbalance, steroid changes in pregnancy and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

264 **Membrane-Associated Complex Lipids** (1) Fishman§

Topics will cover the catabolism and biosynthesis of complex sphingolipids; inherited metabolic diseases associated with abnormal sphingolipid metabolism; membrane receptors for hormones and toxins; and other special topics. Prerequisite: Bioc 221–22. (Spring)

David Irwin is Assistant Research Professor of Biochemistry in the G.W.U. School of Medicine
d Health Sciences.
Jack Yehudi Vanderhoek is Assistant Research Professor of Biochemistry in the G.W.U. School
f Medicine and Health Sciences.
Oscar Irving Dodek, Jr., is Clinical Professor of Biochemistry in the G.W.U. School of Medi-
ne and Health Sciences.
Peter Harvey Fishman is Professional Lecturer in Biochemistry in the G.W.U. School of Medi-
ne and Health Sciences.

270 **Biochemistry of the Immune Response** (2) Goldstein and Staf
Immunoglobulin structure, function, and regulation; complement sys tem; biochemistry of mediators of cellular immunity; molecular biol ogy of the differentiation of the immune system. Prerequisite: Bio 201 or 221–22. (Spring)

271 **Current Topics in Immunology** (2) Goldstein and Staf
Directed readings in the area of biochemical immunology. May be repeated for credit. Enrollment limited to graduate students in bio chemistry. Prerequisite: Bioc 270.

280 **Biochemistry of Nerve Tissue** (2) Staf
Content includes molecular structure and function of nerve tissue intra- and inter-neuronal communication mechanisms; biochemistry of various brain dysfunctions; and other special topics. Prerequisite Bioc 201 or 221–22. (Fall)

295 **Research in Biochemistry** (arr.) Staf
Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staf
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staf
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staf
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BIOLOGICAL SCIENCES

Professors R.L. Weintraub *(Emeritus)*, K.F. Parker *(Emeritus)*, S.O. Schiff *(Chairman)*, D.L. Atkins, R.K. Packer
Adjunct Professors T.E. Bowman, M.L. Jones, L.S. Kornicker, H.A. Rehder, F.A. Chace, Jr., R. Manning, C.G. McWright
Professorial Lecturers W.A. Shropshire, Jr., J.C. Petricciani, C.F. Cleland, R.W. Read, H. Hoffman
Associate Professors R.E. Knowlton, H. Merchant, T.L. Hufford
Adjunct Associate Professors W.D. Hope, D.L. Pawson, J. Rosewater, C.F. Roper, M. Rice
Associate Professorial Lecturers P.E. Spiegler, J.C.C. Dickens, B.M. Timber lake, D.A.P. Houston, R.P. Eckerlin
Assistant Professors R.P. Seifert, D.E. Johnson, A.L. Mescher, R. Donaldson, J.R. Burns, E.F. Wells

Bachelor of Arts or Bachelor of Science with a major in biology, botany, or zoology (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the

requirement for meaningful initiation into the social sciences and the humanities.)

2. Prerequisite courses—BiSc 11–12, or equivalent.

3. Required courses in related areas—Chem 11–12; Chem 151–52 and 153–54, or 50. (The following courses are strongly recommended: Math 31; Phys 1, 2; two years of French, German, or Russian; Stat 91 or 127.)

4. (a) Required courses for the major in biology—a minimum of 24 semester hours of second-group courses, which should include at least six hours in biology, six in botany, and six in zoology. In fulfillment of the botany requirements, students may take either BiSc 133 *or* 137, but not both.

(b) Required courses for the major in botany—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in botany, and no more than one zoology course may be included. In fulfillment of the botany requirements, students may take either BiSc 133 *or* 137, but not both.

(c) Required courses for the major in zoology—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in zoology, and no more than one botany course may be included.

5. The Bachelor of Science degree requires two semesters of introductory physics with lab in addition to the requirements listed above.

Minor in biology—12 semester hours of second-group courses,* which must include at least 3 hours in biology, 3 in botany, and 3 in zoology.

Minor in botany—12 semester hours of second-group courses,* of which 8 hours must be in botany.

Minor in zoology—12 semester hours of second-group courses,* of which 8 hours must be in zoology.

Master of Science in the field of biology, botany, or zoology—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151–52 and 153–54, or 50: Math 31; Phys 1, 2.

Required: the general requirements, pages 91–99. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). With the permission of the department a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Master of Arts in the field of Museum Studies, with specialization in the biological sciences, see pages 397–99.

Doctor of Philosophy in the field of biology, botany or zoology—Required: the general requirements, pages 91–94, 99–101, plus satisfactory completion of a Preliminary Examination and the General Examination in four areas of biology. The program of study, fields of study, and tool subjects are determined in consultation with an advisory committee appointed for each candidate.

Research fields in *Biology:* cell physiology, cytogenetics, developmental genetics, and molecular genetics.

Research fields in *Botany:* photobiology, phycology, plant ecology, plant physiology (microorganisms), plant physiology (vascular plants), and taxonomy.

Research fields in *Zoology:* animal ecology, bioenergetics; comparative neuroanatomy; comparative physiology; herpetology; histophysiology; inverte-

* BiSc 171 through 176 do not count toward fulfillment of the 12-hour second-group course requirements.

brate zoology; marine biology; radiation biology; taxonomy, anatomy and physiology of mollusks; vertebrate anatomy and taxonomy; vertebrate embryology and morphogenesis; vertebrate ichthyology; and vertebrate physiology.

Master of Science and *Doctor of Philosophy in the field of geobiology*, see page 323.

Bachelor of Arts in Education and Human Development with a teaching field in biology—Prerequisite: the education curriculum, pages 114–15.
Required: the biology option and the professional courses listed on page 118.

Departmental prerequisite: BiSc 11–12 or equivalent is prerequisite to all second-group courses in biology, botany and zoology, except by permission of the instructor.

BIOLOGY

First Group

3–4 **Introductory Biology for Nonscience Majors** (3–3) Schiff
Lecture (2 hours), laboratory (2 hours). Survey of biological principles; emphasis on man as a functional organism in the environment. Prerequisite to BiSc 4: BiSc 3. Material fee, $18 per semester. (Academic year)

11–12 **Introductory Biology for Science Majors** (4–4) Hufford, Merchant
Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts and principles are demonstrated through consideration of the plant as an organism. BiSc 12: Beginning principles of inheritance, development, behavior, physiology, systematics, and evolution, using animals as the subject of investigation; designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 per semester. (Academic year)

Second Group

103 **Marine Biology** (4) Knowlton
Lecture (2 hours), laboratory and field (3 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Consideration of the open ocean and coastal eco-systems and man's influence on them. Recommended prerequisite: BiSc 101 or 102, 106, 140. Material fee, $24. (Spring)

107 **Field Biology** (4) Merchant
Field study of altitudinal zonation, species hybridization, territoriality, energy balance, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer)

108 **Organic Evolution** (3) Seifert
Synthetic theory of organic evolution including treatment of speciation, adaptive radiation, biogeography, population biology, sociality, and human evolution. (Spring)

111 **Introductory Microbiology** (4) Staff
Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $24. (Fall and spring)

122 **Cell Biology** (3) Donaldson
Structure and function of biological molecules, viruses, and cellular organelles. Prerequisite: one semester of organic chemistry. (Spring)

123 **Cell Biochemistry** (3) Donaldson
Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, biosyntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Fall)

124 **Cell Biochemistry Laboratory** (2) Donaldson
Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Material fee, $24. (Fall)

127 **Genetics** (3) Johnson
Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action. (Fall and spring)

128 **Genetics Laboratory** (1) Johnson
Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $24. (Fall and spring)

138 **Advanced Genetics** (3) Johnson
Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)

140 **General Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels, and energy transfer, and their relationship to the structure and function of population, species, communities, and ecosystems. Material fee, $24. (Fall)

144 **Aquatic Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physiochemical properties, typical habitats and communities. Laboratory fee, $24. (Spring, odd years)

167 **Radiation Biology** (3) Schiff
Chemical, physical, and biological aspects of radiation; effects of radiation on cells and organisms, with emphasis on mammals; genetic effects. Recommended: two years of biological sciences, and chemistry or physics. (Fall)

171 **Undergraduate Research** (arr.) Staff
Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152; 16 semester hours in

Biological Science courses. Material fee, $20 per semester hour. (Fall and spring)

172 **Independent Study in Cell and Molecular Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

173 **Independent Study in Developmental Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

174 **Independent Study in Organismic Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

175 **Independent Study in Genetic and Evolutionary Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

176 **Independent Study in Environmental Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

185 **Human Nutrition** (3) Donaldson
Dietary requirements and their underlying physiological and biochemical bases; composition of natural and modified foodstuffs and additives; social and economic aspects of nutrition. (Fall)

Third Group

206 **Seminar: Radiation Biology** (3) Shropshire
Actions of radiation at subcellular, cellular, and organismal levels; factors modifying radiation damage; practical considerations in radiation exposure. Prerequisite: BiSc 167 or equivalent. (Spring)

208 **Bioenergetics** (3) Merchant
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions. Prerequisite: BiSc 140 or equivalent. (Fall, odd years)

209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) Seifert
Principles and mechanisms of evolution in animals and plants; population phenomena, speciation, and evolution above the species level. (Fall, even years)

220 **Seminar: Cell or Plant Biochemistry** (3) Donaldson
Course content changes each session, alternating between selected topics in cell biochemistry and plant biochemistry. May be repeated for credit. (Spring, even years)

227 **Seminar: Genetics** (3) Johnson
Current problems in genetics. Students are required to present one

seminar covering the full class period. May be repeated for credit. (Fall, odd years)

228 **Population Genetics** (3) Johnson
Consequences of Mendelian inheritance on the population level as exemplified by gene frequencies, random mating, inbreeding, differential fertility and mutations. (Fall, even years)

229 **Cytogenetics** (3) Staff
Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution. (Fall)

230 **Human Genetics** (3) Staff
Genetic mechanisms of transmission and expression of human traits, with emphasis on biochemical and cytogenetic aspects. Prerequisite: BiSc 127 or equivalent; previous course work in cell biology or cell biochemistry strongly recommended. (Spring)

243 **Seminar: Ecology** (3) Merchant
In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) Mescher
Survey of current research in experimental morphology, developmental genetics, biochemical development, and developmental endocrinology. Prerequisite: BiSc 146 or equivalent. (Fall)

249 **Seminar: Developmental Biology** (3) Mescher
Discussion and reports on current literature in developmental biology, with emphasis on developmental genetics. Prerequisite: at least one course each in developmental biology and genetics. (Spring)

272 **Electron Microscopy** (3) Atkins, Donaldson
Theory and practice of scanning and transmission electron microscopy, including specimen preparation, photography, and analysis of ultrastructural observations. Material fee, $40. (Spring)

295 **Research** (arr.) Staff
Investigation of special problems. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BOTANY

Second Group

105 **Field Biology of Woody Plants** (4) Wells
(Formerly Local Flora)

Lecture (2 hours), laboratory and field (4 hours). Field and laboratory studies on local and cultivated woody flora. Material fee, $20. (Fall)

106 **Field Botany—Lower Plants** (4) Hufford

Lecture (2 hours), laboratory and field (4 hours). Primarily for non-specialists, emphasizing algae, mosses, and ferns. Material fee, $18. (Alternate summers)

109 **Developmental Plant Anatomy** (4) Hufford

Demonstration, observation, discussion (6 hours). Initiation and ontogeny of tissues and organs of vascular plants. Material fee, $20. (Spring)

110 **Comparative Plant Morphology** (4) Hufford

Demonstration, observation, discussion (6 hours). Evolutionary morphology and life histories as a basis for a phylogenetic study and the critical roles plants have in human welfare. Material fee, $20. (Fall, even years)

125 **Flowering Plants** (4) Wells

Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionary development, and principles of systematics of flowering plants. Material fee, $20. (Spring)

133 **Economic and Etho-botany** (3)
(Formerly BiSc 33, Plants and People)

A study of the importance of plants to humans: consideration of plants in folklore, in religion, in commerce, and as food. Narcotic, medicinal, and poisonous aspects of plants will be discussed. Material fee, $18. (Spring)

135 **Plant Physiology** (4) Donaldson

Lecture (2 hours), laboratory (4 hours). Physiology of seed plants with emphasis on growth, development, tropisms, and reproduction. Prerequisite: Chem 11–12. Recommended: Chem 50 or 151–52. Material fee, $24. (Spring, odd years)

137 **Horticulture** (4) Read and Staff

Lecture (2 hours), laboratory (4 hours). Basic principles of growth, propagation, and care of ornamental plants. Material fee, $20. (Fall and spring)

141 **Plant Ecology** (4) Wells

Lecture (2 hours), laboratory (4 hours). Several Saturday and weekend field trips required. Material fee, $18. (Fall)

149 **Freshwater Algae** (4) Hufford

Observation and discussion (6 hours). Systematics, morphology, physiology, and water quality interrelationships of freshwater algae. Field experience, including at least one weekend field trip. Material fee, $18. (Fall, odd years)

Third Group

221 **Seminar: Systematics of Flowering Plants** (3) Wells
Review of current work in various disciplines of systematic research; topics of special interest to participants. May be repeated for credit. (Spring, odd years)

238 **Seminar: Current Topics in Phycology** (3) Hufford
(Spring, odd years)

242 **Seminar: Plant Ecology** (3) Wells
(Spring, even years)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ZOOLOGY

Second Group

101 **Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory (4 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Material fee, $24. (Fall)

102 **Advanced Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory and field (4 hours). Study of invertebrate systems (cells, tissues, organs, organisms), with emphasis on functional aspects (physiology and ecology) and taxonomy of important groups. Prerequisite: BiSc 101 or equivalent. Material fee, $24. (Spring, odd years)

104 **Comparative Vertebrate Anatomy** (4) Atkins
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $24. (Fall and spring)

120 **Animal Behavior** (3) Staff
Principles of animal behavior, including mechanisms and manifestations from simple reflex systems to social interaction. (Spring, even years)

143 **Animal Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, $24. (Spring, even years)

145 **Introduction to Vertebrate Embryology** (4) Mescher
Lecture (2 hours), laboratory (4 hours). Origin and early development of the individual, formation of organ systems. Emphasis on frog, chick, and pig, with reference to human embryo. Material fee, $24. (Fall; spring, odd years)

146 **Experimental Developmental Biology** (4) Mescher
Lecture (2 hours), laboratory (4 hours). Introduction to the experi-

mental, biochemical, and genetic analysis of developing systems through examination of the literature and laboratory experiments. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology or genetics and Chem 50 or 151–52. Laboratory fee, $24. (Spring, odd years)

148 **Histology** (4) Burns

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $24. (Spring; fall, odd years)

153 **Survey of Neurobiology** (4) Atkins

Lecture (3 hours), laboratory (2 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system; emphasis on mammals. Prerequisite: BiSc 104. Material fee, $24. (Fall)

155 **Parasitology** (4) Staff

Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology; survey of parasitic types from protozoa through arthropods. Material fee, $20. (Fall, even years)

156 **Ichthyology** (4) Burns

General biology of fishes, including structure, function, distribution and evolution, with emphasis on adaptations. Prerequisite: background in comparative anatomy and vertebrate zoology, or permission of instructor. Lecture (3 hours), laboratory (2 hours). Material fee, $20. (Fall, even years)

157 **Comparative Endocrinology** (4) Burns

Lecture (3 hours), laboratory (2 hours). Comparative study of basic principles of chemical integration, neuro-endocrine relationships, and mechanisms of hormone action. Prerequisite: BiSc 104, 165 and/or concurrent registration in Chem 151–52 or Chem 50. Material fee, $24. (Fall)

161 **Entomology** (4) Seifert

Lecture (2 hours), laboratory (4 hours). The biology of insects, including their morphology, physiology, development, behavior, and ecology. Material fee, $20. (Fall)

162 **Insect Population and Evolutionary Biology** (4) Seifert

Lecture (3 hours), laboratory (3 hours). Study of the interactions of insects with other organisms and the effects these interactions have on insect evolution. Insects as disease vectors and as pollinators, and mimetic systems will be discussed. Prerequisite: BiSc 108, 140, or 161, or permission of instructor. Material fee, $20. (Spring, even years)

163 **Human Physiology** (3) Packer

Introduction to the function of organ systems of the human body. (Fall)

164 **Human Physiology Laboratory** (1) Packer

Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163, Material fee, $28. (Fall)

165 **Vertebrate Physiology** (4) Packer

Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $28. (Spring)

Third Group

204 **Seminar: Invertebrate Zoology** (3) Knowlton

Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. (Fall)

205 **Comparative Pathology** (3) Zook

Joint offering of the Biological Sciences and Pathology Departments. An introduction to the study of disease and disease mechanisms in vertebrates, and comparison with disease in man. Recommended: courses in anatomy, histology, and physiology. (Fall)

211 **Adaptation and Natural Selection** (3) Seifert

An examination of special evolutionary problems and conflicts as well as peculiar adaptive characters of certain species. These include the evolutionary basis of sociality, sex, maleness and femaleness, and the conflict between individual and population survival. Prerequisite: BiSc 108 or permission of instructor. (Spring, odd years)

212 **Seminar in Comparative Reproductive Biology** (3) Burns

Review of selected topics in animal reproduction, including neuroendocrine regulation, reproductive cycles and behavior, and gonadal pathology. (Spring)

252 **Seminar: Neurobiology** (3) Atkins

Study of current publications in comparative neurobiology. May be repeated for credit with instructor's permission. (Spring, even years)

253 **Evolution of the Nervous System** (4) Atkins

Invertebrate and vertebrate nervous systems. The development of increasing complexity in neurons and systems of neurons, and the establishment of alternate pathways to accomplish particular functions. Lecture and laboratory. Prerequisite: BiSc 153. Material fee, $24. (Spring, odd years)

256 **Fish Physiology** (3) Packer

A survey of major organ systems and homeostatic mechanisms of fishes with emphasis on teleosts. Prerequisite: BiSc 163 or 156 or equivalent. (Spring, odd years)

265 **Comparative Animal Physiology** (3) Packer

Survey of the physiological basis of adaptation of animals to diverse environments, emphasis on nonmammalian vertebrates. Prerequisite: BiSc 165 or equivalent. (Fall)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

BUSINESS ADMINISTRATION

Professors R.B. Eastin, H.R. Page, F. Amling, G. Black, P.D. Grub, G.P. Lauter, J. Zwick, N.M. Loeser, A. El-Ansary, W.J. Keegan, B. Burdetsky *(Chairman)*, S.F. Divita, R. Eldridge, R.F. Dyer, W.C. Handorf
Professorial Lecturers G.M. Arnaoot, W.K. Kyle, S.S. Malawer, F.E. McLaughlin, J.P. Murphy, S.C. Silverberg, S. Thurm
Associate Professors S.N. Sherman, H.J. Davis, E.L. Hullander *(Visiting)*, F. Ghadar, J.M. Sachlis, Y.S. Park
Associate Professorial Lecturers J.T. Heisler, J.H. Joseph, A.C. Meiners, Jr., D.A. Peterson, A.G. Pieruccini, C.W. Richards, S.A. Seelig
Assistant Professors T.M. Barnhill, D.R. Kane, P.B. Malone III, W.D. Breneman, N.G. Cohen, J.R. Carey, M.L. Liebrenz, M.H. Bowers, L.M. Maddox, J.B. Thurman, P.S. Peyser *(Visiting)*
Assistant Professorial Lecturers D.A. Ford, M.W. Hudgins, M.J. Moran, M.A. Regalia, R.D. Rutz, H.F. Shamwell, Jr., C.C. Shepherd
Instructor M.L. Slagle *(Visiting)*
Lecturers D.C. Cooke, R.M. Eldridge, G.I. Friend, M.S. Katzman, Y.H. Lee, G.S. Thomas

Programs of study in business administration leading to the degrees of *Bachelor of Business Administration, Master of Business Administration, and Doctor of Business Administration* are offered by the School of Government and Business Administration (see pages 135–64).

First Group

51 Introduction to Business (3) — Carey, Davis, Thurman
Structure, activities, and problems of business enterprise; its contribution to the individual and to society; careers in business. (Fall and spring)

Second Group

101 The Business Environment (3) — Slagle
Economic and legal environment of business enterprise; social and political influences; contemporary problems and issues. Restricted to seniors in the BBA program or with permission of instructor. (Fall and spring)

102 Fundamentals of Management (3) — Davis, Malone, Thurman
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking. (Fall and spring)

105 Personnel Management (3) — Burdetsky, Malone
The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities. (Fall and spring)

106 Leadership in Personnel Management (3) — Burdetsky
A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 105 or permission of instructor. (Fall)

107 Collective Bargaining (3) Burdetsky
American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 105 or permission of instructor. (Spring)

113 Real Estate Investment (3) Handorf
Principles of real estate investment including valuation, appraisal, financing, and development, in addition to a discussion of the mortgage market and its institutions. Prerequisite: BAd 131. (Fall)

121 Fundamentals of Insurance and Risk Management (3) Cohen
Function of insurance and risk management in business enterprise. (Spring)

131 Business Finance (3) Barnhill, Handorf, Sachlis
Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, stockholder relationships. Prerequisite: Acct 51–52; Econ 1; Math 51–52; Stat 51. (Fall and spring)

132 International Business Finance (3) Eldridge, Hudgins
Analysis of the international economic environment and its influence on corporate financial management of international operations. (Fall and spring)

133 Capital Formation (3) Handorf
The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 131. (Spring)

134 Working Capital Management (3) Cohen
The analysis of corporate short-term sources and uses of funds. Optimization techniques and case studies emphasized. Bank lending practices evaluated within working capital area. Prerequisite: BAd 131. (Fall)

138 Investment and Portfolio Management (3) Amling, Cohen
Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk-reward and computer-aided analysis. Prerequisite: Acct 51–52, BAd 131.

139 Advanced Financial Management (3) Barnhill, Handorf
Analysis and readings investigating the theoretical relationships underlying financial management. Emphasis is placed upon cases for decisions involving long-term assets, financings, dividend policy, and other special topics in finance. Prerequisite: BAd 131.

141 Basic Marketing Management (3) El-Ansary, Liebrenz, Maddox
Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2, Stat 51. (Fall and spring)

143 Marketing Research (3) Dyer
Basic methods and techniques of marketing research, problem defini-

tion, data collection, market survey and experimental design, data analysis and presentation. Special topics: attitude research, questionnaire construction and concept testing. Prerequisites: BAd 141, Stat 51, Mgt 118. Laboratory fee, $15. (Fall and spring)

144 **International Marketing Management** (3) El-Ansary, Lauter, Liebrenz, Lee

Scope of international markets; factors in assessing world marketing opportunities; international marketing product, pricing, distribution, and promotion program development in dynamic world markets and global environment. Prerequisite: BAd 141. (Fall and spring)

145 **Sales Management** (3) Staff

Organization of sales department, sales planning and forecasting, quotas, territories, performance standards, and analysis and control of distribution costs. Prerequisite: BAd 141, 143, 146. (Fall)

146 **Consumer Behavior** (3) Dyer, Maddox

An examination of the social, cultural, and psychological factors influencing the behavior of consumers. Topics include: models of buyer behavior, consumption patterns, market segmentation research, attitude formation and change, brand loyalty, the adoption of innovations, and store choice decisions. Marketing management and public policy implications of consumer research studies are stressed. Prerequisite: BAd 141 or permission of instructor. (Fall and spring)

147 **Advertising** (3) Thurm, Maddox

Planning an advertising campaign. Consumer and market information, message appeals, media selection and scheduling, measuring effectiveness. Current criticism and regulation of the advertising function. Other major marketing communication tools, including personal selling and sales promotion, presented. Prerequisite: BAd 141, 143, 146. (Fall and spring)

148 **Retailing Management Seminar** (3) El-Ansary

A study of retailing management and strategy covering the current environment of retailing, retail market and financial analysis, store location and design, inventory management, and non-store and service retailing. Industry executive and student presentations and case analyses. Prerequisite: BAd 131, 141, 143, 146. (Spring)

149 **Marketing: Strategic Planning** (3) Divita, El-Ansary, Keegan

A capstone seminar for marketing majors. Analytical integration of material covered in previous marketing courses. Marketing strategy literature, financial dimensions of marketing management, and comprehensive cases. Prerequisite: BAd 141, 143, 145, 146, and one additional marketing major field course. (Spring)

161 **Commercial Law** (3) Murphy, Breneman, Kane

Fundamental concepts and principles of law encountered in business activity; contracts, bailments, agency, sales, negotiable instruments, bankruptcy, other topics. Basic legal considerations in business decision-making. (Fall and spring)

171 **Transportation and Logistics Management** (3) Sherman

Systems and alternatives of the logistics manager; carrier, user, and public policy perspectives; urban and inter-city mobility; cost, rate, competition, and service problems; public financing and regulation of

carrier enterprise; coordination of the modes of transportation. (Fall)

175 **Introduction to International Business** (3) Grub, Hudgins
Social, cultural, political, legal, and technological environment of multinational business, emphasizing host-government/multinational corporation interface. Terminology, trade uses and practices, conditions essential for successful business operations, including export and import procedures, documentation, and legal requirements; physical movement of goods in international business. (Fall and spring)

176 **International Business Theory and Policy** (3) Eldridge, Lee
Theoretical relationships underlying international business transactions, governmental and corporate policy, significant trends and their causes. (Fall and spring)

178 **International Business Policy and Operations** (3) Grub, Thomas
Integration of functional activities in international and multinational firms, through selected case studies and discussions, to develop and stimulate decision-making from an overall business policy standpoint. Prerequisite: BAd 175. (Fall and spring)

181 **Manufacturing Production** (3) Hullander
Basic principles and methods of manufacturing production. Manufacturing facilities, plant and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent; BAd 102, 105. (Fall and spring)

182 **Small-Business Management** (3) Staff
Theory and practice of small business management. Focus on effective management of small firms, essentials of planning and organizing the firm, financial and administrative controls, evaluation of alternative business forms, and comparison of purchase of an on-going firm, franchising, and new business start-ups. The role of small business in American society; historical perspective of entrepreneurship. Prerequisite: BAd 102.

190 **Special Topics in Business Administration** (3) Staff
Experimental offering; new course topics and teaching methods.

198 **Business Policy and Administration** (3) Loeser, Thurman
Integration of functional activities in arriving at overall business policy decisions. Prerequisite: BAd 102, 105, 131, 141, 181. (Fall and spring)

199 **Individual Research** (arr.)
Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

Third Group

201 **Social and Legal Environment of Business** (3) Breneman, Kane
This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Contemporary social forces acting on business management; business responsibility,

ethics. Business under the U.S. Constitution, federal legislation, leg precedents and agency orders. Emphasis on court decisions relati to business. (Fall and spring)

202 **Business-Government Relations** (3) Blac
Economic, political, and philosophical foundations of the busines government relationship in theory and practice. Antitrust, publi utility, and other regulation, consumer and environmental protectio conditions of employment; effective business response—presen status and future prospects. Prerequisite: BAd 201. (Fall an spring)

203 **Regulation of Business: Administrative Law** (3) Breneman
Principles of federal regulation of business through administrativ agencies. Analysis of sources and limits of agency powers and pre rogatives in adjudicative, executive, and rule-making functions Theoretical and practical aspects of regulation. A supervised re search project involving observation and analysis of rule-making and adjudicatory processes is required. Prerequisite: BAd 201, 202, or equivalent. (Fall)

204 **Legal Aspects of International and Multinational Business** (3) Petersen
Legal environment of international and multinational business in cluding legal systems, antitrust laws, regulation of direct investment international arbitration and expropriation; topics of current interest (Fall and spring)

205 **Business Representation and Lobbying** (3) Black, Joseph
Strategies, tactics, and techniques used by business in representing itself to the legislative and executive branches and regulatory agen cies of the federal government. Legal and practical constraints. Ethical considerations. (Fall)

206 **Seminar: Business, Economics, and Public Policy** (3) Black
Analysis and discussion of selected issues by students and repre sentatives of government and business. Prerequisite: BAd 201, 202.

208 **Personnel Management** (3) Eastin, Loeser, Malone
Survey of personnel management practices and procedures, including labor-management relations. (Fall and spring)

209 **Seminar: Personnel Management** (3) Eastin
Industrial personnel and manpower management, research in ad vanced problems. (Spring)

210 **The Personnel Manager** (3) Eastin
The personnel manager and his or her place in the organization, relation to other executives, policy role and relations with chief executive. Problems of the senior personnel executive. Prerequisite: BAd 208 or permission of instructor.

211 **Leadership and Executive Development** (3) Loeser, Malone
Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels; executive selection and development. Prerequisite: Mgt 200 or permission of instructor. (Fall and spring)

212 **Unionism and Collective Bargaining** (3) Burdetsky, Bowers
The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)

213 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3) Burdetsky, Bowers
Current problems and issues. Prerequisite: BAd 212. (Spring)

216 **Federal Government Regulation of Society** (3) Tolchin
Joint offering of the Departments of Business Administration and Public Administration. Analysis of the federal regulatory process as it affects the public and private sectors. Specific problems involving presidential management, systemic failures, dejudicializing the regulatory process, policy conflicts, reform efforts, legislative oversight, and economic deregulation. Emphasis is placed on new solutions. (Spring)

230 **Business Financial Management** (3) Handorf, Sachlis, Barnhill, Cohen, Peyser
This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Theory, policy, and practice in financial management; financial analysis, sources of funds, investing, capital planning, and budgeting. Prerequisite: Acct 201, Econ 217, Mgt 202 and 218, or equivalents. (Fall and spring)

231 **Financial Decision-making** (3) Sachlis, Peyser
Theory and practice of business finance with emphasis on special topics within valuation, including capital budgeting, mergers, acquisitions, bankruptcy, and liquidation. Prerequisite: BAd 131 or 230. (Fall and spring)

233 **International Business Finance** (3) Ghadar, Park, Zwick, Arnaoot
Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 131 or equivalent. (Fall and spring)

234 **Seminar: Capital Formation** (3) Handorf, Rutz, Regalia
Determinants of saving and investment and resultant funds flow are evaluated. Special emphasis on the level and risk structure and term structure of interest rates. The role and management of financial institutions is stressed. Prerequisite: BAd 131 or 230. (Fall and spring)

235 **Financial Management** (3) Barnhill, Cohen
Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 231. (Fall and spring)

236 **Seminar: International Banking** (3) Park, Zwick
International financial intermediation and international banking. Functioning of international financial markets, public policy issues in international banking, regulation of multicountry banking institutions and the effect of international banks on national monetary policies. Prerequisite: BAd 233, 234. (Fall and spring)

237 **Investment Analysis** (3) Amling, Cohen

Risk-reward analysis of security investments including analysis of national economy, industry, company, and market; introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 131 or 230. Laboratory fee, $15. (Fall and spring)

238 **Seminar: Investment and Portfolio Management** (3) Amling, Cohen

Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 237. Laboratory fee, $15.

239 **Financial Theory** (3) Sachlis

In-depth theoretical analysis of business financial topics, including asset management, financial structure, dividend policy and the capital asset pricing framework. Prerequisite: BAd 231, 237.

240 **Marketing Management** (3) Dyer, El-Ansary, Divita, Liebrenz

This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level Requirement. Emphasis on the marketing process from the viewpoint of the firm. Market analysis, product planning, channels of distribution, pricing, and promotional decision-making; developing an integrated marketing plan. Prerequisite: Econ 217–18. (Fall and spring)

241 **Advanced Marketing Management** (3) Divita, El-Ansary, Liebrenz

For MBA students in concentrations other than marketing. Case analysis of complex marketing problems. Current developments in marketing practice. The relationship of marketing to environmental forces and other business functions. Prerequisite: BAd 240. (Fall and spring)

242 **Product/Service Strategy** (3) Dyer, Cohen

Management of the activities involved in marketing new and existing products and services. The innovation system (behavioral and organizational) of product decisions, product planning processes, product auditing, new products and the law, new product/service trends. Marketing of intangibles and services. Prerequisite: BAd 240, 243, 246. (Spring)

243 **Seminar: Marketing Research** (3) Dyer

The marketing research process: designing, conducting, and using market research studies. Survey and experimental designs. Data analysis with statistical software packages. Laboratory fee: $15. Prerequisite: BAd 240, Mgt 202 and 218, or equivalent. (Fall and spring)

245 **Promotion Management/Marketing Communications** (3) Dyer, Maddox

Examination of promotion mix from a systems perspective supported by analytical methods and concepts regarding consumer attitudes and behavior. Topics: social context of promotion, role of communication in marketing, behavioral concepts and communications research, message design, economic and financial criteria, development of a promotion program. Prerequisite: BAd 240, 243, 246.

246 **Buyer Behavior** (3) Dyer, Maddox

Examination of theory and recent research concerning buyer decision processes. Interdisciplinary behavioral science studies on individual, family, and organizational purchase behavior are treated. Present and potential applications for marketing in the public and private sector are illustrated with cases. Prerequisite: BAd 240 or permission of instructor.

247 **Marketing and Public Policy** (3) Divita, McLaughlin

Examination of principal areas of public policy formulation affecting marketing practice. Topics: advertising, warranties, product safety, health issues, consumer information systems, informal and formal redress mechanisms, business responsibilities. Government business and advocate viewpoints presented. Prerequisite: BAd 240, 245, or 246; or permission of instructor. (Fall)

248 **International Marketing** (3) Lauter, El-Ansary, Liebrenz

Organizational structures. Analysis of international markets. Market-entry strategies and product policies. Special issues. Channels of distribution, promotional and price policies. Prerequisite: BAd 240. (Fall and spring)

249 **Marketing Strategy** (3) Divita, Keegan

Analysis of complex marketing problems involving policy and operational decisions; emphasis on creative marketing strategy. Prerequisite: completion of at least three Second-Level marketing courses or permission of instructor. (Fall and spring)

250 **Industrial and Government Marketing** (3) Divita

Overview of industrial and government markets. Acquisition process, buyer behavior, demand analysis, technology, product/service mix, bid decision and proposals, sales management and promotion, distribution, pricing, and marketing control. Prerequisite: BAd 240. (Spring)

253 **Marketing Channels** (3) El-Ansary

Marketing channels and vertical marketing systems from a managerial viewpoint. Marketing channels viewed as super-organizations requiring planning, organization, coordination, and control. These tasks require an understanding of the channel's task environment, manufacturing, wholesaling, retailing, and physical distribution institutions. Focus on system performance and management of interorganizational relationships among channel institutions. Prerequisite: BAd 240. (Fall)

254 **Regional International Marketing Systems** (3) Lauter

Discussion of the political, economic, legal, and social characteristics of Europe, Japan, Latin America, Asia, the Middle East, Africa, the USSR, Eastern Europe, and China, as they affect the marketing of goods and services in these regions. Identification of appropriate market-entry strategies and discussion of selected case histories. Prerequisite: BAd 240, 248. (Fall and spring)

255 **Multinational Corporations in the World Economy** (3) Zwick, Grub

Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strate-

gies, relationships to other nations; national and internation controls; future of the multinational corporation. (Fall and sprin

256 **Seminar: International Trade** (3) Eldridg

Classical and modern concepts of international trade theory, instr ments and institutions of trade policy, barriers to trade, preferenti treatment and trading blocs, trends and issues. (Fall and spring

258 **External Development Financing** (3) Ghadar, Par

Problems and alternative solutions for required capital formation an the financing of payment imbalances through external sources. Insti tutions and instruments for financing national development. Emphasi on planning as affected by energy policies, inflation, recession, changes in the international monetary system and revised attitudes among developed countries regarding bilateral and multilateral as sistance. Prerequisite: BAd 233 or permission of instructor. (Fal and spring)

259 **International Business Negotiations** (3) Ghadar

This course focuses on the essential characteristics of International Business Negotiations (IBN) with particular emphasis on the process and changes in that process over time. Formulation of concepts and preliminary frameworks to assist in understanding IBN; develop ment of systematic approaches to planning for and conducting IBN. The course assists in developing skills of the participants in the art of IBN while integrating other functional and international aspects in the broader environmental framework. Prerequisite: BAd 255 (Fall and spring)

261 **Applied Microeconomics** (3) Black, Peyser

Applications of economic theory to public and private decisions af fected by the economic and general business environment. Demand, production, costs, profits, investments, inventory, market structure. Prerequisite: Econ 217 and Mgt 202 or equivalents. (Spring)

262 **Macroeconomic Policy and Business** (3) Black

Interpretation of economic conditions in the short- and long-run; theory and practice of monetary and fiscal policy; applications of business conditions analysis to business planning, management, and policy. Prerequisite: Econ 218 and Mgt 202 or equivalents. (Fall)

279 **Purchasing and Materials Management** (3) Sherman

Industrial purchasing and materials management principles and prac tices. Organization and functions in materials management. Determi nation of requirements, source selection, buying practices, policies, and ethics. (Fall)

280 **Procurement and Contracting** (3) Sherman

Principles and concepts essential to effecting large procurement pro grams. Planning, sourcing, and contractual design for diverse acqui sitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. (Fall and spring)

282 **Government Contract Administration** (3) Sherman

Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes

negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Prerequisite: BAd 280 or permission of instructor. (Fall)

283 **Pricing and Negotiation** (3) Sherman

Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Prerequisite: BAd 280 or permission of instructor. (Spring)

285 **Systems Procurement and Project Management** (3) Sherman

Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Analysis of cases in public and private sector contractural or assistance activities. (Spring)

290 **Special Topics in Business Administration** (3) Staff

Experimental offering; new course topics and teaching methods. May be repeated once for credit.

292 **New Venture Initiation** (3) Staff

Theory and practice of entrepreneurship and small business management. Historical perspective of entrepreneurship in the U.S. and abroad, essentials of planning a new business venture, sources of financing, evaluation of alternative new business ventures, and analysis of business functions needed to get started. On-going firms, franchising options, and new business start-ups. Prerequisite: Mgt 202, 218; Econ 217–18; BAd 201, 230, 240; Acct 201.

293 **Operations and Logistics Management** (3) Staff

Management of work in production, commercial, service, and public organizations. Analytical tools for planning and establishing operating systems and for their operation, control, and modification. Examination of processes, products, services, equipment, and facilities. Relationships of human systems and operating systems. Prerequisite: Acct 201; Mgt 202, 218; Econ 217–18; BAd 201, 230, 240.

295 **Research Methods** (3) Davis

Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. Use of computer library programs and preparation of a form of business report. (Fall and spring)

296 **Business Decision Simulation** (3) Staff

Managerial decision-making in a diversified firm in a simulated competitive environment in which a complex situation is played out using computers. Prerequisite: advanced master's or doctoral degree standing.

297 **Business Policy Formulation** (3) Page, Eastin

This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Analysis of operational situations and policy issues. Developing and implementing solutions to managerial problems. Prerequisite: advanced master's degree standing and completion of at least eight Second-Level MBA courses. (Fall and spring)

298 **Directed Readings and Research in Business Administration** (3) Staff

Supervised readings or research in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

299 **Thesis Seminar** (3) Staff

Examination of thesis standards, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff

(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood

An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

331 **Seminar: Financial Markets** (3) Amling, Sachlis, Peyser

Research seminar in corporate financial theory, investment portfolio theory, and capital market theory. May be repeated once for credit. Prerequisite: BAd 234, 238, 239.

341 **Seminar: Marketing** (3) El-Ansary, Dyer

Examination of major theoretical developments in marketing. Topics include advances in research methods, models and data analysis. Emphasis on emerging concepts in consumer behavior, channels, marketing communication and marketing information systems.

358 **Colloquium on International Business** (3) Eldridge, Grub, Zwick

Examination of selected topics in international business, with emphasis on major new theoretical and empirical developments. (Fall)

359 **Colloquium on Comparative Management** (3) Staff

Comparative analysis of management systems under different economic, social, and political conditions. Generic characteristics of management and how modified in different environments. Examination of selected literature. (Spring)

365 **Seminar: Applied Economics** (3) Blair

Special topics and applications of analytical tools to business decision-making and policy. Prerequisite: BAd 261, 262; or permission of instructor. Staff

381 **Seminar: Materials and Operations Management** (3) Staff

Recent developments in manufacturing production and materials management; impact of technological, economic and social change; significant related trends. Private and public sector policy implications.

tions. New and emerging analysis techniques. Prerequisite: BAd 279, 280, or equivalent; or permission of instructor.

391 **Seminar: Business Management** Burdetsky, Eastin

Examination of major current issues, both theoretical and empirical, affecting the development of the business enterprise. Topics to be announced. Emphasis on policy and strategic issues affecting the total enterprise.

398 **Advanced Reading and Research** (arr.) Chitwood

Limited to students preparing for the Doctor of Business Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Chitwood

Limited to Doctor of Business Administration candidates. May be repeated for credit.

CHEMICAL TOXICOLOGY

See **Forensic Sciences.**

CHEMISTRY

Professors T.P. Perros *(Chairman)*, W.E. Schmidt, D.G. White, J.B. Levy, N. Filipescu, A.D. Britt, E.A. Caress
Associate Professors D.A. Rowley, M. King, D. Ramaker
Special Lecturer T. Freund *(Visiting)*

Bachelor of Arts or Bachelor of Science with a major in chemistry (departmental)—The department offers two undergraduate majors designed to give students broad training in the basic divisions of chemistry: analytical, inorganic, organic, and physical. *Major I* provides considerable concentration in chemistry. However, it permits a wider selection of electives and thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. *Major II* is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified to the American Chemical Society as having met the minimum requirements for professional training. Two foreign languages are recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for Major I and Major II—Chem 11–12 and 22, or 15–16; Math 30, 31; Phys 1, 2.

3. (a) Required courses for Major I—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only); Chem 111–12, 113–14, 122, 134, 141, 151–52, 153–54.

(b) Required courses for Major II—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only); Chem 111–12, 113–14, 122, 141–42 or 156 in lieu of 142), 151–52, 153–54, 235; Math 32; one course selected from Chem 195, 207, 213, 221, 222, 251; ForS 240, 242; Math 111, 139; Phys 161, 165, 175; Stat 197.

Twelve semester hours in French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish (students in Major II should elect German) are recommended for students in both Major I and Major II.

For graduation with Special Honors in chemistry, a student must register for Chem 195 at the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in chemistry as evaluated by the faculty.

Bachelor of Science/Master of Science in the field of chemical toxicology—This is a five-year program leading to the B.S. in the field of chemistry and the M.S. in the field of chemical toxicology. The first three years of the program consist of undergraduate course work. Application for admission to the M.S. program in chemical toxicology will be made to the Graduate School of Arts and Sciences during the second semester of the third year; for admission to the graduate portion of the program acceptance must be obtained prior to the start of the fourth year of the program. If acceptance into the M.S. program in chemical toxicology is not desired or not obtained, the requirements for the B.S. in chemistry, either Major I or II, may be fulfilled by the successful completion of appropriate courses during the fourth year of study. If acceptance into the M.S. program in chemical toxicology is obtained, the B.S. in chemistry will be awarded after the successful completion of the fourth year of the program.

The following requirements must be fulfilled:

1. Students must meet the general requirements as stated on pages 79–81–87, and 91–99. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Course requirements: Chem 11–12, 22, 111–12, 113, 114, 122, 134, 141–42, 151–52, 153–54; Phys 1, 2; BiSc 11–12, 129; Math 30, 31, 32; Stat 127; Bioc 221–22; Phys 191 (for graduate credit); Phar 203; ForS 240, 242, 245; either ForS 246 or Chem 299–300; and two courses chosen from ForS 246, 248, 249, 269.

3. Twelve semester hours of a foreign language are recommended.

Minor in Chemistry—Required: Chem 11–12, 22, 50, and 111; Chem 151, 152, 153, or 154 may be substituted for Chem 50.

Master of Science in the field of chemistry—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. The required 30 semester hours of graduate work must include Chem 213 and 221, and at least two of the following: Chem 207, 236, and 251. The thesis requirement, Chem 299–300, must be in analytical, inorganic, organic, or physical chemistry. Chem 156, or its equivalent, is prerequisite to research work in the field of organic chemistry. A reading knowledge examination in German or Russian must be passed, or proficiency in computer programming must be demonstrated. A student who intends to become a doctoral candidate is strongly urged to take Chem 207 as early as possible in the master's program.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Prerequisite: a bachelor's degree with a major in chemistry or in geology from this University, or an equivalent degree.

Required: the general requirements, pages 91–99, including Chem 111–12, 299–300, and Geol 141, 241, and 249. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Department of Chemistry or Geology must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Doctor of Philosophy in the field of chemistry—Required: the general requirements, pages 91–94, 99–101. Chem 207, 213, 221, 235, 251, and 350 are normally

required of the doctoral student, in addition to other courses as determined by consultation with the departmental program committee. A reading knowledge examination in German or Russian must be passed, *and* proficiency in computer programming must be demonstrated. Cumulative examinations replace the General Examination requirement.

Research fields: analytical chemistry, inorganic chemistry, organic chemistry, physical chemistry (electrochemistry, kinetics, magnetic resonance, theoretical), physical organic chemistry (reaction mechanisms), and structure and synthesis of natural products.

Ph.D. students in chemistry may substitute up to 12 hours of Dissertation Research (Chem 399) in the form of course work jointly approved by the Chemistry Department and the Graduate Program in Science, Technology, and Public Policy. The purpose of this option is to provide a useful background for chemistry doctoral students who may be employed in government agencies dealing with science, technology, and public policy programs. The 12 hours may be selected from the following courses: PSc 222, 223, 252, 203, 217; PAd 214, 260; Mgt 233, 234.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Required: the general requirements, pages 91–94, 99–101, including a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examinations in four fields, including chemistry and geochemistry.

Bachelor of Arts in Education and Human Development with a teaching field in chemistry—Prerequisite: the education curriculum, pages 114–15.
Required: the chemistry option and professional courses on page 118.

Graduate Placement Examinations: All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the department of chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical, organic, inorganic, and physical chemistry) are of the multiple-choice type. These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's background.

Registration: Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation and laboratory sections. The work of the junior and senior years must be approved by the department.

All graduate students are required to participate in the seminar and colloquium programs.

PHYSICAL SCIENCE

First Group

3–4 Contemporary Science for Nonscience Majors (3–3) Filipescu

Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological and medical science. Chem 3 is not prerequisite to

Chem 4 but both courses must be satisfactorily completed to fulfi the meaningful initiation requirement. Laboratory fee, $20 per semester (Academic year)

CHEMISTRY

First Group

11–12 General Chemistry (4–4) Britt, Perros, Rowley, White

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $35 per semester. (Chem 11 and 12—fall and spring)

13 General Chemistry (4) Britt

For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry; organic chemistry. Prerequisite: Math 31, Phys 14 or 15. Laboratory fee, $35. (Fall)

15–16 Intensive General and Analytical Chemistry (4–4) Staff

(Honors Course)

Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour). Equivalent to Chem 11–12 and 22, but with selected topics studied in depth. Prerequisite to Chem 15: high school physics and chemistry. Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, $35 per semester. (Academic year)

22 Introductory Quantitative Analysis (4) Staff

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $35. (Fall and spring)

50 Introduction to Organic Chemistry (4) Caress

Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Prerequisite: Chem 12 or 16. Laboratory fee, $35. (Spring)

Second Group

110 Introduction to Physical Chemistry (3) Levy

Topics include chemical thermodynamics, chemical kinetics, electrochemistry, solution chemistry, membrane and phase equilibria, and others. Prerequisite: Chem 16 or 22, Math 31, Phys 2; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111–12 or an equivalent course. (Summer)

111–12 Physical Chemistry (3–3) Ramaker and Staff

Gas laws, chemical thermodynamics, chemical equilibrium, kinetics, quantum chemistry, atomic and molecular spectra, structure of solids

liquids, and macromolecules. Prerequisite to Chem 111: Chem 16 or 22; Math 31; Phys 2. Prerequisite to Chem 112: Chem 111. (Academic year)

113 **Physical Chemistry Laboratory** (2) Ramaker, Schmidt
Laboratory complement to Chem 111. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $35. (Fall)

114 **Instrumental Analysis Laboratory** (2) Schmidt, Ramaker
Laboratory complement to Chem 112 and 122. Prerequisite or concurrent registration: Chem 112, 113, and 122. Laboratory fee, $35. (Spring)

122 **Instrumental Analysis** (3) Schmidt
Theory of instrumental methods in qualitative and quantitative analysis, determination of structure, and study of reaction mechanisms with emphasis on electroanalysis, spectrophotometry, and chromatography. Correlated with Chem 114. Prerequisite or concurrent registration: Chem 112. (Spring)

134 **Descriptive Inorganic Chemistry** (2) Perros
Intermediate-level course emphasizing the descriptive chemistry of the elements. Prerequisite: Chem 16 or 22, 152. Prerequisite or concurrent registration: Chem 111. (Fall)

141–42 **Advanced Experimental Chemistry** (2–2) White, Caress
Designed to provide the chemistry major with facility in experimental methods common to all disciplines of chemistry. Prerequisite: Chem 154. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $35 per semester. (Academic year)

151–52 **Organic Chemistry** (3–3) Levy, King
Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 **Organic Chemistry Laboratory** (1–1) Staff
Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $35 per semester. (Academic year)

156 **Qualitative Organic Analysis** (3) King
Lecture (1 hour), laboratory (6 hours). Separation of mixtures such as essential oils, peptides, commercial pharmaceuticals, carbohydrates, and/or others as appropriate; identification of their components using spectroscopic techniques. Lecture emphasizes the practical considerations in separation methods (including GLPC, TLC, and HPLC) and the spectral interpretation of unknown substances. Prerequisite: Chem 16 or 22, 154. Laboratory fee, $35. (Spring, odd years)

191 **History of Chemistry** (2) Perros
Historical development of chemistry from antiquity to the 20th century. Prerequisite: Chem 12 or 16. (Fall, odd years)

195 **Undergraduate Research** (1 or 2) Staff
Research on problems approved by the staff. Approval must be

obtained prior to registration. May be repeated once for credi
Laboratory fee, $21 per semester hour. (Fall and spring)

Third Group

207 **Chemical Bonding** (3) Ramake
Quantum mechanics, approximate methods, electron spin, Pauli prin
ciple, atomic and molecular structure. Prerequisite: Chem 11
(Fall)

211–12 **Physical Chemistry** (2–1) Ramaker and Staf
Same as Chem 111–12. Admission only by departmental permissio
Credit assigned upon satisfactory completion of Chem 213. (Ac
demic year)

213 **Chemical Thermodynamics** (3) Staf
Application of thermodynamics to chemical problems. Thermochemis
try, homogeneous and heterogeneous equilibria, statistical calculatio
of thermodynamic properties, electrochemistry. Prerequisite: Che
112 or 212. (Spring)

216 **Statistical Mechanics** (3) Ramake
Introduction to classical and quantum statistics designed to acquain
students with basic principles and methods. Prerequisite or concur
rent registration: Chem 207 or permission of instructor. (Offere
as the demand requires)

218 **Molecular Spectroscopy** (3) Ramake
Applications of quantum chemistry, molecular orbital theory, valenc
bond theory, vibration and rotation of molecules, IR and electroni
spectroscopy. Prerequisite: Chem 207. (Spring, odd years)

221 **Advanced Analytical Chemistry I** (3) Brit
Theory and application of recent spectrometric methods of analysis
including electrical, magnetic, and optical instrumentation. Prerequ
site: Chem 122. (Fall)

222 **Advanced Analytical Chemistry II** (2 or 3) Schmid
Lecture (2 hours), laboratory (3 hours—optional). Theory and ap
plication of electroanalysis and separations by physiochemical meth
ods. Prerequisite: Chem 122. Laboratory fee, $21. (Spring, even
years)

233 **Organometallic Chemistry** (3) Whit
Survey of organometallic compounds with emphasis on the com
pounds of lithium, boron, aluminum, silicon, the transition metals
and the catalytic role of certain organotransition metal complexes.
Prerequisite: Chem 235 and 251, or permission of instructor.
(Spring, even years)

235–36 **Advanced Inorganic Chemistry** (3–3) Rowle
Application of modern chemical theories to inorganic substances and
reactions followed by a detailed study, developed from the periodic
table, of the chemistry of the more common elements. Prerequisite to
Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 23
(Academic year)

251–52 **Advanced Organic Chemistry** (3–3) Filipescu
Synthesis, reactions, and properties of organic compounds; fundamental theories of organic chemistry, emphasis on reaction mechanisms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Chem 252: Chem 251. (Academic year)

257 **Physical-Organic Chemistry** (3) Levy
The transition state theory of chemical kinetics, applications to reaction mechanisms; kinetic isotope effects, linear-free energy relationships, concentrated and "super" acids, Woodward-Hoffman rules, free radical reactions. Prerequisite: Chem 252 or permission of instructor. (Fall, odd years)

258 **Synthesis and Structure Determination in Organic Chemistry** (3) Caress
Methods of structure determination and synthesis of complex organic molecules. Prerequisite: Chem 251 or permission of instructor. (Fall, even years)

259 **Polymer Chemistry** (3) Barkin
A study of the preparation, properties, and structure of macromolecules. Prerequisite: Chemistry 152 and 111 or permission of instructor. (Fall)

295 **Research** (arr.) Staff
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, $21 per semester hour. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

350 **Choice and Design of a Research Problem** (1) Staff
Development in written form of an original research plan, fully referenced, and its oral defense. If a grade of *C* is received, the student must repeat this course for credit and must develop a new research plan. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy cumulative examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

CHINESE

See **East Asian Languages and Literatures.**

CLASSICS

Associate Professor J.E. Ziolkowski *(Chairman)*
Associate Professorial Lecturer M.E. Norton
Assistant Professors E.A. Fisher, M.D. Ticktin
Assistant Professorial Lecturer Y.M. Moses

Bachelor of Arts with a major in classical humanities (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite courses—Clas 1–2, 3, 4; or equivalent; or Clas 11–12, 13–14; or equivalent; and Clas 71, 72. Students may substitute for Clas 3, 4, or 13–14 two additional courses (6 semester hours) consisting of Clas 64 and a course to be selected in consultation with the departmental advisor.

3. Required courses in the major—(a) 12 semester hours selected from second-group classics courses; (b) 18 semester hours selected from Art 101, 102, 103, 111; Hist 105, 107, 108, 109, 110, 111; Phil 111; PSc 105; Rel 143.

Bachelor of Arts with a major in classical archeology and classics (departmental)—An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.

3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110; 15 semester hours in second-group courses in Greek or Latin, including Clas 138. (A reading knowledge of French and German is recommended.)

Minor in classical humanities—(a) 6 semester hours selected from Clas 1–2 or 11–12; (b) 9 semester hours selected from Clas 3, 4, 13, 14, 71, 72, 105, 108, 113, 127, 170, 185, 186; (c) 6 semester hours selected from Art 101, 102, 103, 111; Hist 107, 108, 109, 110.

COURSES IN GREEK, HEBREW, LATIN, AND YIDDISH

First Group

1–2 Beginning Latin (3–3) Ziolkowski

A year course; credit toward a degree at this University given on completion of Clas 2. Grammatical essentials of the language, appropriate reading selections, development of English derivatives, introduction to Roman life and literature. (Academic year)

3 Intermediate Latin: Prose and Poetry (3) Norton

Development of ability to read and understand Latin literature of moderate difficulty. Prerequisite: Clas 1–2 or equivalent. (Fall)

4 Vergil's Aeneid (3) Norton

Significant passages of Vergil's famous epic—in Latin; reading and discussion of the entire poem in translation. Prerequisite: Clas 3 or permission of instructor. (Spring)

11–12 Beginning Greek: Classical (3–3) Fisher

A year course; credit toward a degree at this University given on completion of Clas 12. Study of the grammar, vocabulary, and structure of Greek. Reading of selected ancient authors. (Academic year)

13–14 Intermediate Greek: Classical (3–3) Staff

Review of grammar; extensive reading of prose and poetry: e.g., Homer, Herodotus, or a play. (Academic year)

21–22 Beginning Hebrew (3–3) Ticktin

A year course; credit toward a degree at this University given on completion of Clas 22. Grammatical essentials of the language; read-

ings selected from classical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $17.50 per semester. (Academic year)

23–24 **Intermediate Hebrew** (3–3) Moses

Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives. (Academic year)

25–26 **Yiddish for Reading and Conversation** (3–3) Ticktin

Grammatical essentials of the language, appropriate reading selections, conversational exercises for beginners. (Academic year)

Second Group

103 **Modern Hebrew Nonfiction** (3) Moses

Directed readings in humanities and social sciences. Development of linguistic skills necessary for independent research. May be repeated for credit. (Fall)

104 **Modern Hebrew Fiction** (3) Moses

Study of selected modern Israeli short stories and poems. May be repeated for credit. (Spring)

109–10 **Major Latin Authors** (3–3) Ziolkowski

Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3–4 or permission of instructor. (Academic year)

134 **Medieval Latin** (3) Andrews

Selections from the Vulgate and representative Latin writers through the 11th century. Prerequisite: Clas 3, 4; or permission of instructor. May be taken for graduate credit with approval of instructor. (Spring)

139–40 **Major Greek Authors** (3–3) Staff

Selections from a wide variety of Greek prose, drama, and poetry, suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year)

185–86 **Directed Reading** (1, 2, or 3) Staff

Reading of material in the student's field of interest. Admission by permission of instructor. May be taken for graduate credit.

COURSES IN ENGLISH TRANSLATION

First Group

41 **Roots of the Western Tradition** (3) Staff

Same as Engl/Hist/Phil/Rel 41. Basic ideas of western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. To be taken in conjunction with Engl 13. (Spring)

63 **Greek and Latin Origins of Medical Terms** (3) Fisher

Mastery of medical terminology by learning word elements from

Greek and Latin and the principles which govern both the formation of medical words and the derivation of their meanings.

64 **Greek and Latin Origins of English Words** (3) Fisher
Study of Greek and Latin elements in English to improve vocabulary and facilitate understanding of the language of science, philosophy, politics, etc.

71 **Greek Civilization** (3) Fisher
Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall)

72 **Roman Civilization** (3) Ziolkowski
Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring)

100 **Modern Hebrew Literary Classics** (3) Ticktin
Prose and poetry of a century of writing from the beginning of the Hebrew literary renaissance to contemporary Israeli literature, including works of Bialik, Agnon, Peretz, Hazaz, Amichai, and Oz.

Second Group

101 **Israeli Society and Culture: Literary Perspectives** (3) Ticktin
A study of literature reflecting such contemporary issues as the conflict between the "builders' generation" and their children; the cultural contacts of Ashkenazim and Sefardim; image of the Arab; impact of the Holocaust; Zionist ideals and current realities. (Fall)

102 **Contemporary Israeli Short Stories and Poetry** (3) Ticktin
An introduction to post-1948 writers, including A. B. Yehoshua, Amos Oz, David Shahar, Aharon Apfelfeld, Dahlia Ravikovitch, Yehuda Amichai, Haim Gury, Amir Gilboa, and Amalia Kahana-Karmon. (Spring)

105 **Special Topics in Classical Literature** (3) Staff
Focus on a selected topic, such as death in classical antiquity or the hero, or on study of a genre, such as satire or oratory. May be repeated for credit.

108 **Classical Mythology** (3) Norton
Mythology of the Greeks and Romans from the creation of the world: tales of the gods, heroes, and great families that have influenced literature, art, and music. (Fall)

113 **Greek and Roman Drama** (3) Staff
Selected masterpieces of Greek and Roman tragedy and comedy. (Spring)

127 **Classical Influence on Western Civilization** (3) Ziolkowski
A survey of Greek and Roman influence on Western civilization relevant to modern America: literature, art, law, science, philosophy, etc. (Fall)

138 **Seminar: Classical Studies** (3) Staff
Survey of the broad range of sources and resources involved in pursuing classical studies: standard references, periodicals, library holdings, papyrology, textual criticism, history of classical scholarship.

170 **Women in Classical Antiquity** (3) Norton
In-depth study and discussion of readings from ancient and modern sources on the role of women in Greek and Roman society.

CRIME IN COMMERCE

See **Forensic Sciences.**

CRIMINAL JUSTICE

See **Forensic Sciences** and **Sociology.**

DANCE

See **Human Kinetics and Leisure Studies.**

DRAMA

See **Speech and Drama.**

EARLY MODERN EUROPEAN STUDIES

Committee on Early Modern European Studies

R.E. Kennedy *(Chairman)*, F.S. Grubar, C.A. Linden, G.E. Mazzeo, J.P. Reesing, Jr., R.H. Schlagel, K. Thoenelt, D. Wallace

The Columbian College of Arts and Sciences offers an interdisciplinary program in Early Modern European Studies. This humanities program is designed to enhance the student's understanding of the history, philosophy, religion, sciences, literature, and arts of the five centuries (1300-1800) during which the Western World began to take on its modern dimensions. The program is directed by an interdepartmental committee.

Bachelor of Arts with a major in Early Modern European Studies—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Requirements for the major:
   a. Six semester hours of third year level French, German, or Spanish literature courses taught in the language, from among the following: Fren 120, 121–22, 123–24; Ger 103–4, 111–12, 131–32; Span 121–22, 123–24, 125
   b. Phil 112
   c. Rel 145
   d. PSc 106
   e. Twenty-seven semester hours of art history, history, and English literature, with the course distribution to be determined in consultation with the program advisor, and with a minimum of 6 hours from each of the following: Art 104–5, 106–7, 108, 113–14, 121–22; Engl 125–26, 127–28, 129, 130, 131–32; Hist 101, 105, 121–22, 123, 141, 148, 151, 153, 154

EAST ASIAN LANGUAGES AND LITERATURES

Professor C.W. Shih
Associate Professorial Lecturer M.J. Evans
Assistant Professors G.C.Y. Wang, D.L. Lee *(Chairman)*, J. Chaves *(Visiting)*
Lecturer M. Wang

Bachelor of Arts with a major in Chinese Language and Literature—The requirements are as follows:

1. The general requirements as stated on pages 74, 78–79, and 171. (Sixty semester hours from Columbian College, or the equivalent from another accredited institution are required.)
2. Prerequisite courses—Chin 5–6 (preferred); or Chin 1–2, 3–4, and 9; or Chin 7–8 and 9.
3. Required for the major:

(a) *Departmental major in the School of Public and International Affairs*—Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

(b) *Field-of-Study major in Columbian College of Arts and Sciences*—Completion of Chin 11–12, 109–10, 163–64, and the passing of the major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Bachelor of Arts with a major in East Asian Studies (China or Japan)—See pages 74, 79, and 171.

A Junior Year Abroad Program is available.

Master of Arts in East Asian Studies with a concentration in Chinese Language and Literature. The requirements are as follows:

1. The general requirements as stated on pages 173–78.
2. Prerequisite: 24 semester hours of Chinese language.
3. 12 semester hours of Chinese literature, 6 hours of history, and 6 hours of relevant East Asian courses.
4. 6 semester hours of thesis research.

CHINESE

First Group

***1–2 Beginning Mandarin Chinese, Level I** (3–3) Staff

Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 per semester. (Academic year)

***3–4 Beginning Mandarin Chinese, Level II** (3–3) G. Wang

Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 Beginning Intensive Mandarin Chinese, Levels I-II (8–8) Lee

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to

* The combination of Chin 1-2, 3-4, and 9, or the combination of Chin 7-8 and 9, is equivalent to Chin 5-6.

Chin 6: Chin 5. Laboratory fee, $17.50 per semester. (Academic year)

*7–8 **Beginning Intensive Mandarin Chinese** (6–6) Lee, Wang

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 8: Chin 7. Laboratory fee, $17.50 per session. (Summer)

*9 **Beginning Mandarin Chinese, Level II** (4) Lee

Reading of simple modern expository writings. Analysis of syntactic structure and practice in writing. Prerequisite: Chin 4 or 8. Laboratory fee, $17.50. (Fall or spring)

10 **Chinese Calligraphy** (1) M. Wang

Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit. (Fall and spring)

11–12 **Intermediate Intensive Mandarin Chinese** (6–6) G. Wang

Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 6 or 9. Prerequisite to Chin 12: Chin 11. Laboratory fee, $17.50 per semester. (Academic year)

13–14 **Reading Chinese for Beginners** (4–4) Staff

Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students who wish to acquire a reading knowledge without learning to speak or write the language. (Academic year)

22 **Intermediate Chinese Conversation** (2)

A practical course for improving speaking ability. Prerequisite: 6 credit hours of Chinese or equivalent. May be repeated for credit.

†91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia. (Spring)

93–94 **East Asian Literature—in Translation** (3–3) Staff

Lecture and discussion. Survey of Chinese and Japanese literature, from earliest periods through literary masterpieces of the early 20th century. (Academic year)

Second Group

107–8 **Readings in Modern Chinese** (3–3) Staff

Intensive readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year)

* The combination of Chin 1-2, 3-4, and 9, or the combination of Chin 7-8 and 9, is equivalent to Chin 5-6.

† An interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

109–10 **Introduction to Classical Chinese** (3–3) Shih
Introduction to classical writing in Chinese literature, history, and philosophy. Prerequisite: Chin 6 or 9. (Alternate academic years)

123–24 **Introduction to Chinese Linguistics** (3–3) Lee
Introduction to the history of the Chinese language. Analysis of linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics. (Alternate academic years)

161–62 **Introduction to Chinese Culture** (3–3) Staff
Survey of the Chinese cultural heritage—literature, philosophy, art, religion, and social history—from pre-history to the modern era. Lecture and discussion in English. (Academic year)

163–64 **Chinese Literature in Translation** (3–3) Chaves
An introductory course focusing on major works of poetry, drama, and the novel in their historical and social context. (Academic year)

179–80 **20th-Century Chinese Literature** (3–3) Shih
Short stories of Lu Hsün, Lao She, and others. Informal essays by Lu Hsün, Chou Tso-jen, and Chu Tzu-ch'ing. Drama of T'ien Han and Ts'ao Yü. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

185–86 **Directed Reading** (3–3) Staff
Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)

199–200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3–3) Staff
Conferences and group discussions. (Academic year)

Third Group

271–72 **Poetry of the T'ang and Sung Periods** (3–3) Staff
Reading of works of leading poets. Discussion of content and style. Prerequisite: Chin 109 or equivalent. (Alternate academic years)

273 **Yüan Drama** (3) Shih
Readings of plays by Kuan Han-ch'ing, Ma Chih-Yüan, Cheng Kuang-tsu, Po P'u, and Wang Shih-fu. Prerequisite: Chin 109 or equivalent.

277–78 **Prose Narratives of the Sung, Ming, and Ch'ing Periods** (3–3) Shih
Short stories of the Sung period. Selected readings of Ming-Ch'ing novels. Historical development and stylistic traits. Prerequisite: Chin 107 or equivalent. (Alternate academic years)

299–300 **Thesis Research** (3–3)

JAPANESE

First Group

1–2 **Beginning Japanese, Level I** (4–4) Staff
Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and

pronunciation with graded reading and practice in writing. Prerequisite to Japn 2: Japn 1. Laboratory fee, $17.50 per semester. (Academic year)

3–4 **Beginning Japanese, Level II** (4–4) Staff

Lecture (4 hours), laboratory (1 hour). Continuation of grammar with more emphasis on written language and reading. Prerequisite to Japn 3: Japn 2. Prerequisite to Japn 4: Japn 3. Laboratory fee, $17.50 per semester. (Academic year)

Second Group

111–12 **Japanese Literature in Translation** (3–3) Chaves

An introductory survey of traditional and modern Japanese literature read in English translation: love and nature poetry; theater (classical drama, puppet plays); fiction; diaries. Particular emphasis is placed on the great women writers of Japan. (Academic year)

ECONOMICS

Professors J.W. Kendrick, C.T. Stewart, Jr. *(Chairman)*, J. Aschheim, R.P. Sharkey, H. Solomon, S. Levitan, T. Suranyi-Unger, Jr. *(Research)*, C.Y. Hsieh, J.L. Gastwirth, M.A. Holman, R.M. Dunn, Jr., W.F.E. Long, S.E. Haber, A. Adams *(Research)*, R.S. Goldfarb

Adjunct Professors T.F. Carroll, J. Grunwald, P. Swamy, J. Hardt, E.M. Hadley, V. Tanzi

Professorial Lecturers O.C. Snellingen, T.D. Simpson, N.E. Terleckyj, J.C. Miller

Associate Professors R.Y. Yin, J.R. Barth, A.M. Yezer, O. Havrylyshyn, R.M. Scheffler, J.J. Cordes, J. Pelzman, E.S. Pearsall *(Research)*

Associate Professorial Lecturers D.G. Tuerck, J.E. Fredland, T.R. Robinson, R.E. French, A. Gelb

Assistant Professors M.R. Metzger, V. Fon, H.S. Watson, M.L. Marlow, P. Gotur, G.E. Wright, Jr.

Assistant Professorial Lecturers R. Meese, E. Offenbacher, E. Suss, R. Bernknopf, G. Caprio, N. Behravesh

Bachelor of Arts with a major in economics (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Econ 1–2.
3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; six semester hours of a social science other than economics.
4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

Minor in economics—a) 18 credit hours in economics, including Econ 1, 2, 101, 102, 121, and one other 100-level course in economics; b) 6 credit hours of an approved statistics sequence, such as Stat 111–12; or 6 hours selected from Math 31, 32, 41–42, 51–52; or 3 hours of an approved statistics course plus 3 hours selected from Math 31, 32, 41–42, 51–52.

Master of Arts in the field of economics—Prerequisite: a Bachelor of Arts degree with a major in economics from this University, or an equivalent degree. An understanding of basic calculus is assumed for those entering the Master of Arts program in economics.

Required: the general requirements, pages 91–99, including (1) Econ 203–4, 205, and 275 or 279; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; (4) completion of a tool requirement (either the passing of a reading knowledge examination in one foreign language or the satisfactory completion of one of the following courses: Math 124, Stat 97, or Stat 157); and (5) either a thesis (Econ 299–300) or 12 semester hours selected from additional third-group economics courses.

Doctor of Philosophy in the field of economics—Required: the general requirements, pages 91–94, 99–101, including (1) Econ 202, 203–4, 205–6, 215–16, 379 or 380, and 24 additional semester hours of approved graduate course work including Econ 275 or 279; (2) passing of the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee; (3) completion of the tool requirement: the passing of a reading knowledge examination in one foreign language, plus the satisfactory completion of Math 124, Stat 197, or Stat 157 (a minimum of six semester hours in approved graduate course work, completed with a grade of *B* or above, in a department other than Economics, is permitted as a substitution for the language reading examination); and (4) a dissertation to demonstrate the candidate's ability to do original research in one of the following fields: econometrics development, economic history, economic policy, economic theory, environmental economics, health economics, history of economic thought, industrial organization, international economics, labor economics, mathematical economics, monetary ecoonomics, national income accounting, natural resources economics, public finance, regional and urban economics, and Soviet economics.

Departmental prerequisite: Econ 1–2 is prerequisite to all other courses in economics except Econ 217–18.

First Group

1–2 Principles of Economics (3–3) Hsieh, Long, Dunn

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics. (Econ 1 and 2—fall and spring)

***91 East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 Intermediate Microeconomic Theory (3) Yin, Metzger, Fon

Analysis of supply, demand, and pricing. (Fall and spring)

* Interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

102 **Intermediate Macroeconomic Theory** (3) Kendrick, Yin
Theories of national income determination and growth. (Fall and spring)

104 **History of Economic Thought** (3) Hsieh
History of the major schools of economic thought, influence of changing problems on the development of economic theory. Prerequisite: Econ 101, 102.

105 **Economic Conditions Analysis and Forecasting** (3) Kendrick
Theory and empirical analyses of economic trends and fluctuations; use of economic indicators and simple econometric models. (Fall)

121 **Money and Banking** (3) Barth, Marlow
Nature of money, credit, commercial banking, and other financial institutions in the U.S. monetary system. (Fall and spring)

122 **Monetary Theory and Policy** (3) Aschheim, Barth
Analysis of role of money in economic activity in terms of supply of and demand for loanable funds, interest rates and price level. Problems of U.S. monetary policy. Prerequisite: Econ 121. (Spring)

123 **Introduction to Econometrics** (3) Staff
Joint offering of the Economics and Statistics Departments. Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 41; Stat 111. (Spring)

130 **Comparative Economic Systems** (3) Aschheim
Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

133 **Economy of the Soviet Union** (3) Pelzman
Development and main features of economic life in the Soviet Union. (Fall)

134 **Comparative Communist Economic Systems** (3) Pelzman
Analysis of economic development and performance of the Soviet Union and other Soviet-type economies. Institutional aspects and quantitative measures of performance. (Spring)

136 **Natural Resources and Environmental Economics** (3) Yezer
Analysis of market mechanisms for allocating energy and natural resources; cases of market failure in the use of the environment; policies to improve resource allocation using market and regulatory strategies. (Spring)

141 **Women in the Labor Market** (3) Haber
Application of the theory of the household and investment in human capital to female labor force participation, marriage, and family formation; analysis of sex discrimination. (Fall)

142 **Labor Economics** (3) Haber
Analysis of labor supply and demand; measurement and theory of unemployment; occupational choice; wages, prices, and unemployment; poverty and income maintenance. (Spring)

147 **Economic History of Europe** (3) Sharkey
Joint offering of the Economics and History Departments. European economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

148 **Health Economics** (3) Scheffler
Analysis of the determination of prices, output, and productivity in the health services sector of the economy.

151 **Economic Development** (3) Wright
Economic problems of underdeveloped nations, with emphasis on economic theories of development and empirical measurement of development problems.

153 **Poverty in America** (3) Yezer
Joint offering of the Economics and Sociology Departments. Exploration of social and economic causes of poverty in the United States and evaluation of present and proposed anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups.

157 **Urban and Regional Economics** (3) Yezer
Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.

158 **Industrial Organization** (3) Long
Analysis of the structures and production, pricing, and related practices of industries with emphasis on their significance and on appropriate economic policies. (Spring)

159 **Government Regulation of the Economy** (3) Staff
Economic analysis of the rationale for effectiveness of government regulation in the American economy. (Spring)

160 **Social and Economic Indicators** (3) Staff

161 **Public Finance I** (3) Cordes, Watson
Theoretical and institutional analysis of government expenditures and intergovernmental fiscal relations. (Fall)

162 **Public Finance II** (3) Cordes, Watson
Theoretical and institutional analysis of tax policy and debt management. (Spring)

165 **Economics of Human Resources** (3) Stewart
Economic analysis of education and training, information and research, and other contemporary problems. (Fall)

169 **Introduction to the Economy of Communist China** (3) Yin
Background, organization, and operation of the economy. Appraisal of performance and analysis of problems of development. (Fall)

170 **Introduction to the Economy of Japan** (3) Hadley
Analysis of the structure and growth of the Japanese economy. (Spring)

179–80 **U.S. Economic History** (3–3) Sharkey

Joint offering of the Economics and History Departments. Process of economic growth from Colonial times to the present. Development of various sectors in the economy and their interdependence. Econ 179: 1607-1865. Econ 180: 1865 to present. (Academic year)

181–82 **International Economics** (3–3) Dunn, Pelzman

Econ 181: international trade theory and international monetary theory. Econ 182: continuation of international monetary theory; economic development. (Academic year)

185 **Economic History and Problems of Latin America** (3) Staff

Analysis of present structures and problems of Latin American economies. (Spring)

198 **Proseminar in Economics** (3) Aschheim, Suranyi-Unger

Examination of major topics in economic theory and the application of theory and analysis to policy problems. Open only to economics majors in their senior year. (Fall and spring)

199 **Independent Research in Economics** (3) Staff

Under the personal direction of an instructor. Limited to economics majors with demonstrated capacity. Prior approval of instructor required. (Fall and spring)

Third Group

Third-group economics courses (except 217–18) are designed for graduate students in economics or for graduate students with prescribed prerequisites.

202 **History of Economic Thought** (3) Hsieh

Critical analysis and interpretation of the development of economic theory from Plato through the "Keynesian Revolution" and the "Monetarist Counter-revolution." (Fall and spring)

203–4 **Microeconomic Theory** (3–3) Goldfarb, Metzger, Fon

Econ 203: demand, production, cost theory. Prerequisite: Econ 101 or equivalent. Econ 204: market structure, welfare, general equilibrium. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)

205 **Macroeconomic Theory I** (3) Barth

Theories of income, employment and the price level; aggregate supply and demand; consumption, saving, investment and the multiplier; supply and demand for money; government's and central bank's role in the economy. (Fall and spring)

206 **Macroeconomic Theory II** (3) Hsieh

Capital and growth theory. Discussion of Cambridge controversy in the theory of capital and one- and two-sector models of economic growth. Other selected advanced topics in macroeconomics. (Fall and spring)

207 **Business Cycle Analysis** (3) Kendrick

Empirical analysis of American business cycles; evaluation of the methodology and findings of the National Bureau of Economic Research. (Spring)

208 **National Income** (3) Kendrick
Theory and measurement of economic aggregates within an integrated national income accounts framework, including balance sheets and wealth statements. (Spring)

210 **Economic Methodology** (3) Stewart
Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory. (Spring)

215–16 **Mathematical Economics** (3–3) Fon
Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates. (Academic year)

217–18 **Survey of Economics** (3–3) Holman
For graduate students in fields other than economics. Econ 217: price theory. Econ 218: income and employment theory. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)

223–24 **Monetary Theory and Policy** (3–3) Aschheim, Barth
Theory of monetary policy within the framework of contemporary American central banking. (Academic year)

233 **Seminar: Agrarian Reform, Income Distribution, and Development** (3) Carroll
Equity and asset redistribution issues in poverty-oriented rural development, stressing new forms of economic peasant associations, based on recent experiences and strategies in the LDCs. (Fall)

234 **Seminar: Rural and Regional Development Projects** (3) Carroll
Design and evaluation of rural-based investment projects, including rural-urban linkages, with case studies drawn from the experience of international agencies. (Spring)

235 **Energy Resources and Policy** (3) Staff
Consideration of economic and related policy issues directed at energy problems. (Fall)

236 **Middle East Economics** (3) Offenbacher
Survey of Middle East economics emphasizing the application of economic tools to selected issues of importance.

237 **Economics of the Environment and Natural Resources** (3) Holman
Analysis of public policy problems relating to the environment and natural resources development and management. (Spring)

241–42 **Labor Economics** (3–3) Goldfarb
Theory of wages and employment, analysis of labor supply and demand. Structural unemployment; occupational choice; labor market discrimination. (Academic year)

243 **Seminar: Manpower Policy** (3) Levitan
Developments leading to expansion of public investment in manpower resources; evaluation of goals and operations of publicly supported programs. Open to undergraduates. (Fall)

244 **Economics of Education** (3) Adams
Returns to investment in education, allocation of resources to and within education, educational financing.

245–46 **Industrial Organization** (3–3) Staff
Structure and performance of the American economy; emphasis on the economics of antitrust policy and the impact of government regulatory policies. (Academic year)

247 **Seminar: Industrial Organization** (3) Long
Selected topics in regulatory economics and in antitrust economics during alternate years. Prerequisite: Econ 101 or equivalent. (Spring)

248 **Health Economics** (3) Scheffler
Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency and allocation of health care services.

251 **Economic Development Theories** (3) Havrylyshyn
Basic theories of economic growth and development. Emphasis on theories inspired by the underdevelopment process. (Fall and spring)

252 **Economic Development Planning** (3) Havrylyshyn
Development planning techniques and practice at both the macro and micro levels. Macro-planning tools analyzed include input/output, multi-sector models, simulation, and linear programming. Micro-planning includes the use of cost-benefit techniques in project analysis. Prerequisite: Econ 251. (Spring)

253 **Productivity Analysis** (3) Kendrick
Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels. (Fall)

254 **Economics of Advertising and Information** (3) Tuerck
Theory and empirical analyses of the role of advertising and information in industry structure and performance. (Fall)

255 **Economics of Technological Change** (3) Staff
Economic principles related to determining the proper federal role in influencing civilian-oriented technological change. (Fall)

257 **Regional Economics** (3) Yezer
Analysis of firm location, patterns of interregional or intermetropolitan production, urban and regional growth and patterns of development. (Fall)

258 **Urban Economics** (3) Yezer
Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 257 or permission of instructor. (Spring)

259 **Income Distribution** (3) Stewart, Carroll
Theoretical and empirical analysis of income distribution, including analysis of policies related to income inequality. (Spring)

261 **Welfare Economics** (3) Stewart
Theories of welfare economics and their applications to public policy; analysis of selected topics in public policy. (Fall)

263 **Theory of Public Finance I** (3) Cordes, Watson
Allocation and distribution aspects of government budget policy, including critical analysis of theories and principles of expenditures and intergovernmental fiscal relations. (Fall)

264 **Theory of Public Finance II** (3) Cordes, Watson
Analysis of the effects of taxation on resource allocation and income distribution; impact of the public debt. (Spring)

265 **Readings in International Taxation** (3) Snellingen
Examination of topics in economic theory and policy of international taxation: taxation of foreign currency and multinational corporations, tax evasion and tax havens, and tax systems for economic development. (Fall)

267 **Seminar: Soviet Economy** (3) Hardt
Development of the Soviet-type economy. Organization, policies, and problems: monetary, production, allocative, foreign trade, economic growth. Admission by permission of instructor. (Fall)

268 **Seminar: Economic Theory and Development in Communist Countries** (3) Hardt
Appraisal of the Soviet model for economic development in the communist world, especially in Eastern Europe and China. Admission by permission of instructor. (Spring)

269 **Economy of Communist China I** (3) Yin
Analysis of organization, operation, policies, and problems. Development of the economy under communism. (Fall)

270 **Economy of Communist China II** (3) Yin
Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)

271 **Economy of Japan** (3) Hadley
Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)

275 **Econometrics I: Introduction** (3) Staff
Joint offering of the Economics and Statistics Departments. Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equation problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Some exposure to matrix algebra is suggested. (Fall)

276 **Econometrics II: Simultaneous Equation Models** (3) Staff
Joint offering of the Economics and Statistics Departments. Economic models and simultaneous equation systems. Prerequisite: Econ 275. Recommended: a course in matrix theory. (Spring)

279 **Methods in Economic Statistics** (3) Gastwirth
Joint offering of the Economics and Statistics Departments. Applica-

tion of statistical methods of economics. Curve-fitting, regression, analysis of variance, and chi-square techniques used to analyze economic data. Prerequisite: a one-year course in statistics. (Fall and spring)

281–82 **International Economics** (3–3) Dunn, Pelzman
Econ 281: theory of international trade and factor movements. Econ 282: international finance. (Academic year)

285–86 **Economic Development of Latin America** (3–3) Grunwald
Econ 285: diversity of structures of Latin American economies; relevant theories; import substituting industrialization; inflation; problems of underemployment and income distribution. Econ 286: structure of trade; protection, exports, and economic development; regional and global economic integration; foreign investment, multinational enterprise, and technology transfer. (Academic year)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Geog/Hist/Rom 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Staff
Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) Staff
Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

298 **Reading and Research** (3)
Limited to Master's degree candidates. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires, and may be repeated for credit with permission of the instructor.

305 **Seminar: Macroeconomics** (3) Staff
Selected topics in macroeconomics. Prerequisite: Econ 205.

312 **Seminar: Price Theory** (3) Staff
Discussion of topics of price theory from recent journal articles.

313 **Seminar: Economic Thought** (3) Hsieh
Continuation of Econ 202. Principal trends in economic thought.

315 **Seminar: Topics in Mathematical Economics** (3) Solomon
Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215–16.

321 **Seminar: Monetary Theory** (3) Aschheim
Recent developments in monetary theory.

341 **Seminar: Labor Economics** (3) Staff
Current problems in theory and policy.

348 **Topics in Health Economics** (3) Scheffler
Review of recent literature and development of research topics. Prerequisite: Econ 248 or permission of instructor.

363 **Seminar: Public Finance** (3) Tanzi
Selected topics of current interest.

378 **Seminar: Topics in Econometrics** (3) Swamy
Joint offering of the Economics and Statistics Departments. A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

379–80 **Readings in Economic History** (3–3) Sharkey
Joint offering of the Economics and History Departments. Econ 379: American economic history. Econ 380: modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)

390 **Seminar: International Economic Theory** (3) Staff
Limited to graduate students, primarily for doctoral students. Examination of recent contributions in this field.

391 **Seminar: International Economic Policy** (3) Staff
Topics selected from current significant policy problems.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

EDUCATION

Professors R.E. Baker, M.N. Rashid, R. Tillman, A. Marinaccio, L.H. Elliott, L. Nadler, M. Brenner, J.G. Boswell *(Chairman)*, C.E. Vontress, S. Kavruck, M. McIntyre, D.A. Moore, L. Winkler, D. Linkowski, F.J. Brown, E.P. Kulawiec, E.W. Kelly, Jr., S.R. Paratore, R. Ferrante, G.L. Horrworth
Professorial Lecturers D. Iwamoto, A.C. Jensen, D.D. Darland
Associate Professors R.I. Peterson, G.D. Wiggs, G.W. Smith, M. Burns, J.C. Heddesheimer, J.A. Greenberg, J.D. Fife, S.A. Wyman, A.P. Kowalski *(Research)*
Associate Professorial Lecturer T.R. Howie

Assistant Professors R.A. Luke, R. Lynch, E.R. Lilly
Assistant Professorial Lecturers M.R. Phelps, P. Callas, D. Holmes, E. Zuniga
Instructors C.B. Stapp *(Research)*, A.H. Macomber *(Research)*
Lecturers C.S.J. Gage, L. Donnels

Programs of study leading to the degrees of *Bachelor of Arts in Education and Human Development*, *Master of Arts in Education and Human Development*, *Master of Arts in Teaching*, *Education Specialist*, and *Doctor of Education* are offered by the School of Education and Human Development (see pages 104–35).

Second Group

Educ 136, 137, 138, 139, 140, 144, and 146 are special methods courses which are to be elected in the senior year by students in the secondary school curriculum after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Prerequisite to all special methods courses: Educ 104, 105 for elementary majors; Educ 131 for secondary majors.

100 Special Workshop in Education and Human Development (arr.) — **Staff**

Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

101 Introduction to Education and Human Services (3) — Macomber, Boswell

The scope of education and human services is defined from historical, philosophical, and cross-cultural perspectives. Field trips and guest speakers. (Fall and spring)

102 Introduction to Human Development I (3) — McIntyre

Lectures and field work. All aspects of development through adolescence; child study techniques. Two to three hours weekly. Field experience in appropriate setting. (Fall and spring)

103 Introduction to Human Development II (3) — Macomber

Lectures and field work experiences. Development from young adulthood on. (Fall and spring)

104 Psychology for Learning and Teaching (3) — Staff

Principles, theory, nature, and course of learning and teaching processes. Examination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour fieldwork sessions. (Fall and spring)

105 Social Issues in Education and Human Services (3) — Boswell, Macomber

Historical and social development of education and human services, contemporary issues, interrelationship of educational and human service institutions, policy considerations and future issues. Prerequisite: Educ 101 or permission of instructor. (Fall and spring)

110 Elementary School Teaching of Reading (3) — Horrworth

Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 104 and 105 or teaching experience.

111 Elementary School Curriculum and Methods (15) Moore and Staff

Diagnostic reading, mainstreaming, mathematics, science, language arts, social studies, music, art, physical education. Pre-student teaching one and one-half days a week. Prerequisite: Educ 102, 103, 104, 105; and senior standing. (Fall)

112 Measurement and Evaluation (3) Kavruck

Basic evaluative measurement techniques: selection, administration and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis. (Fall and spring)

113 Elementary School Art (3) Staff

Lecture and laboratory (3 hours), field work—as arranged. For undergraduates in the elementary school curriculum. Materials and methods. Material fee, $5. (Spring)

118 Elementary Reading: Classroom Diagnosis and Instruction (3) Horrworth

Emphasis on diagnostic procedure aimed at individualizing and improving classroom instruction. Prerequisite: Educ 110 or equivalent. (Fall and spring)

121 International Experiences (1 to 6) Staff

Travel to a foreign country for study of a specific topic. (Fall and spring)

124 Communication Skills and Teaching Strategies (3) Brenner

Theory and practice in the development of professional relationships and communications: teacher-student, museum-school, group strategies. The interview.

125 Museums as Cultural and Educational Resources (3) Stapp

Use of the museum for knowledge and enjoyment; museum objects as primary sources; meetings in D.C.-area art, history, and science museums.

128 Children's Literature (3) McIntyre

Lectures, discussion, and field work. Classics as well as newer books for children and youth are explored. Significant authors and illustrators are highlighted. (Spring)

131 Secondary School Principles and Methods (3) Kulawiec

For seniors. Classroom management and teaching techniques for initiating, guiding, and evaluating learning activities. Group-work to be arranged. Prerequisite: Educ 104 and 105. (Fall)

132 Student Teaching in Early Childhood Schools (3 or 6) McIntyre

For seniors. Supervised teaching in selected prekindergarten or kindergarten class in accredited school; seminar. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent; Educ 150, 152, 153, 154. (Fall and spring)

133 Supervised Experience in Education and Human Development Services (3 to 6) Staff

Field work, internship, and instructional practice: (1) adult education and human resource development (Wiggs); (2) college student development experience (Burns); (3) higher education (Greenberg); (4) mu-

seum education (Nashman); 5) counseling (Heddesheimer). Admission by permission of instructor. (Fall and spring)

134 **Student Teaching in Secondary Schools** (6 to 9) Kulawiec and Staff

For seniors. Admission by permission of instructor. Prerequisite: Educ 131. (Fall and spring)

135 **Student Teaching in Elementary Schools** (6 or 9) Moore and Staff

For seniors. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent. (Fall and spring)

136 **Teaching English in Secondary Schools** (3) Staff

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in English. (Spring)

137 **Teaching Speech** (3) Staff

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in speech or permission of instructor. (Spring)

138 **Teaching Social Studies in Secondary Schools** (3) Staff

Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of social studies. (Spring)

139 **Teaching Art in Secondary Schools** (3) Staff

Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of Art. Material fee, $5. (Spring)

140 **Teaching Mathematics in Secondary Schools** (3) Staff

Lecture (2 hours), field work (2 hours). Prerequisite: mathematics through calculus. (Spring)

144 **Teaching Science in Secondary Schools** (3) Kulawiec

Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of science. (Spring)

146 **Teaching Foreign Languages** (3) Kulawiec

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours of one foreign language. (Spring)

150 **Foundations of Early Childhood Education** (3) McIntyre

Historical development, philosophy, and objectives of nursery schools, kindergartens, and day care; exploration of contemporary programs and models with curriculum implications for schools in the U.S. and abroad. Admission by permission of instructor. (Fall)

152 **Early Childhood Curriculum** (3) McIntyre

Rationale, development, content approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. Admission by permission of instructor. (Fall)

153 **Role of the Professional in Early Childhood Education** (3) McIntyre

Planning, reporting, records, teacher-child and teacher-family interaction, diagnosis and evaluation, working with paraprofessionals and parents. Emphasis on total classroom ecology. Admission by permission of instructor. (Spring)

154 **Community Resources and Materials for the Young Child** (3) McIntyre

Interaction with community agencies for services and resources; equipment, play activities, curriculum materials, and methods for teaching the infant and young child. Admission by permission of instructor. (Spring)

161 **Human Development** (3) Rashid

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

162 **Foundations of Counseling** (3) Heddesheimer, Winkler

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

163 **Personal and Social Adjustment** (3) Winkler

Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

171–72 **Seminar: International Education** (3–3) Moore

Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world-mindedness. Embassy resources utilized. (Summer)

173 **Comparative Education** (3) Kulawiec

A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Fall)

176 **Group Theories and Techniques** (3 or 4) Burns

Group interaction in diads, reference groups, and complex organizations. Focus on theorists including Argyris, Bales, Berne, Lewin, and Sherif. One additional semester hour for techniques laboratory is optional. Prerequisite: permission of instructor. (Spring)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler

Same as HKLS 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference, and related conference activities. (Fall)

187 **Introduction to Sign Language and Deafness** (3) Staff

Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as HKLS 187 and SpEd 187.

188 **Sign Language and Deafness** (3) Donnels

A second course in conversational expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as HKLS 188 and SpEd 188.

193–94 **Research and Independent Study** (arr.) Staff

Individual research under guidance of a staff member. (Academic year)

Third Group

Departmental prerequisite: A degree from an accredited institution is prerequisite to all third-group courses in education. Adequate professional preparation is prerequisite to all third-group courses in education except for those courses limited to students in the M.A.T. degree program. Undergraduate students in their senior year may enroll in third-group courses with permission from the instructor.

200 **Special Workshop in Education and Human Development** (arr.)
Topics to be announced in *Schedule of Classes*. May be repeated for credit.

201–2 **International Education** (3–3) Moore
A study of a selected sample of foreign education systems as they reflect culture, values, people, and current changes in the world today. Research techniques and materials to develop a global frame of reference. Foreign resources utilized. (Summer)

203–4 **Comparative Education** (3–3) Kulawiec
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Academic year)

205 **Foundations of Curriculum Development** (3) Tillman
For experienced teachers. Curriculum research and design, issues and trends, comparison of curriculum patterns, curriculum development in subject areas, and group consideration of current field-related problems. (Fall and spring)

207 **Curriculum Design: Procedures and Materials Organization** (3 to 6) Tillman
For experienced teachers. Construction of courses of study and classroom teaching aids, with direct application to students' situations. (Spring)

208 **Human Development** (3) Rashid
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

209 **Child Development** (3) Rashid
Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)

210 **Adolescent Development** (3) Rashid
Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) Kavruck, Smith, and Staff
Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 **Western Educational Thought** (3–3) Boswell, Darland
Following the themes of certainty, equality, and progress, this course examines the ideas of selected philosophers in their historical context, and relates them to education. Educ 213: From Sumer to the Enlightenment; Educ 214: From the Enlightenment to the present with concentration on the American experience. (Fall and spring)

215 **Practicum for the Gifted** (3 or 6) Rashid, McIntyre
A culminating supervised experience in a variety of settings for students in the M.A. program for the gifted. Admission by permission of the instructor.

216 **Advanced Study of the History of Education** (3) Boswell, Darland
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

217 **Advanced Study of the Philosophy of Education** (3) Boswell, Darland
Individually planned program of study on topic of student's interest. Prerequisite: Educ 213–14 or the equivalent.

218 **Social Foundations of Education** (3) Kulawiec
(Formerly Philosophy of Education)
Forces that shape policies and offerings of the school.

219 **Elementary School Classroom Procedures** (3) Baker
Current theories of teaching and learning and their application to teaching strategies of elementary school teachers. (Spring)

221 **International Experiences** (1 to 6) Staff
Travel to a foreign country for research and study of a specific educational topic as directed by the instructor.

222 **Foundations of Reading Instruction—Early Childhood and Elementary School** (3) Horrworth
Brief historical and psychological background of reading instruction; study and discussion of widely used approaches, methods, and materials for teaching reading; collection and preparation of specific activities for teaching the various reading skills; demonstrations of classroom instructional techniques. (Fall)

223 **Foundations of Reading Instruction in Content Areas—Intermediate and Secondary School** (3) Horrworth
Brief historical and psychological overview; need for teaching reading on these levels; emphasis on basic diagnostic and instructional methods and techniques; teaching demonstrations of basic reading and study skills in content subjects; study of "readability" of content materials; research and application of formulas. (Fall)

224 **Diagnostic Teaching of Reading (K-6)** (3) Horrworth
Classroom diagnostic techniques for elementary teachers; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests as well as other measures of evaluation; study of materials; selecting and planning activities suitable for correction of specific problems; application of readability formulas. Prerequisite: at least one previous course in reading. (Spring)

226 **Reading in Secondary School** (3) Horrworth
Extension of diagnostic and instructional techniques in Educ 223: construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; study and evaluation of materials and teaching procedures; application of readability formulas; class demonstrations of teaching strategies. Admission by permission of instructor. (Spring)

227 **Basic Issues in Elementary Education** (3) Baker
Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall)

228 **Instructional Areas in Elementary Education** (3) Baker
Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education.

233 **Audiovisual Education** (3) Staff
Lecture (2 hours), laboratory (1 hour). Selection, evaluation, and use of audiovisual materials; administrative problems in care, operation, maintenance, and use of such materials and equipment. Material fee, $7. (Spring)

234 **Organization for Personalized Learning in the Open Classroom** (3) Horrworth
Practical application of individualized instruction theories and methods through design, development, implementation, and revision of elementary and secondary level self-instructional packages.

235 **Analysis of Teaching** (3) Boswell, Ferrante
Teaching as work: diagnosing learning skills, program planning and implementation, feedback information on both student and program. (Fall)

236 **Introduction to Education Technology** (3) Staff
Consideration of historical perspective, process, instrumentation, and implementation of self-instructional systems.

237 **Systems Approach to Instructional Design** (3) Wiggs
Application of systems techniques to the development of instructional programs. A workshop design, using multi-media instruction. (Summer)

241 **Education of the Gifted and Talented** (3) Rashid
Nature and discovery of giftedness, provision for the gifted in educational settings. Research findings and issues. (Summer)

242 **The Teacher and School Administration** (3) Brown
Role of federal, state, and local administrative units; school finance; legal controls; school plant; public support; improving teaching conditions. (Fall)

243 **Human Relations in Education and Management** (3) Marinaccio
Principles and practices in human relations between and among learner, teacher, other school personnel, parents, and community.

245 **School and Community** (3) Marinaccio
The school as an important member of a team of social agencies that builds the community.

246 **Administrative Issues in Urban Education** (3) Lilly
Investigation of current issues in urban education. (Spring or summer)

247 **Post-Secondary Career Education** (3) Greenberg
Development, current concepts, agencies involved, problems, and trends in vocational, technical, and occupational education in the United States, with emphasis on the community college. (Spring)

248 **The Teacher and School Supervision** (3) Tillman, Brenner
Nature, organization, human relationships, and techniques. (Fall)

249 **Drug Treatment and Resources** (3) Staff
Individual, social, and cultural factors related to drug abuse. Rehabilitative methods in treating drug abusers; use of community resources. (Spring)

250 **Counseling Drug Abusers** (3) Staff
Counseling theory and practice applied to drug abusers. Crisis intervention, self-help groups, and family therapy; individual and group counseling. (Fall)

251 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

252 **Organization and Administration of Counseling Services** (3) Vontress
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring)

253 **Individual Appraisal in Counseling** (3) Winkler
Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent. (Fall and spring)

254 **The Middle School** (3) Kulawiec
Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent. (Fall)

255–56 **Secondary Education** (3–3) Kulawiec
Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices. (Alternate academic years)

257 **Career Development and Information** (3) Lynch, Vontress
Theories of career development; factors influencing the world of work; procedures for evaluating and using socio-personal, educational, and occupational information. (Fall and spring)

258 **Theories and Techniques of Counseling** (3) Heddesheimer, Vontress
Theories and practices of vocational, educational, and personal counseling. Prerequisite: 12 semester hours in guidance and counseling including Educ 253 and 257. (Fall and spring)

259 **Administration of the Elementary and Secondary School** (3) Lilly

For experienced teachers and administrators. Survey of administration, including practices of modern schools. (Fall)

260 **Supervision in the Elementary and Secondary School** (3) Tillman, Brenner

For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. (Spring)

261 **Practicum in Counseling and Human Development** (3) Rashid and Staff

Intensive counseling experience under supervision. Emphasis on relationship dynamics, analysis, recommendations and follow-up. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258. (Fall and spring)

262 **Internship in Counseling and Human Development** (3) Rashid and Staff

Counseling experience under University and institutional supervision in a variety of settings. Separate sections offered for counseling majors and human development majors. Admission by permission of instructor. (Spring)

263 **Human Resource Development: Training and Education** (3) Nadler, Luke

Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall)

265 **Futurism and Education** (3) Kulawiec

Contemporary view of the future through readings, discussion, simulation, games, and films. Impact of technology on humans and the environment. Future shock, alternative futures, overchoice. (Summer)

268 **Family Counseling** (3) Winkler

The family as a system: how it affects the client and how the client affects it. Didactic presentations, role-playing, and work with simulated families. (Spring)

269–70 **School Business Management** (3–3) Brown

Educ 269: philosophy, responsibilities, and functions of the business management office in public education institutions. Educ 270: practicum in educational business management. (Academic year)

271 **Policy Making for Public Education** (3) Boswell

The nature of educational policy: the role of single-interest groups, the courts, legislative bodies, administrative bureaucracies, and professionals in establishing parameters and allocating resources. Analysis of specific techniques of policy formation. (Summer)

272 **Educational Planning** (3) Zuniga

An examination of the planning movement in education: its historical development and the recent shift in premises, context, and expectations. Different approaches to the planning process; its relationship to the concepts of systems and futurism; participatory, sectorial, and

regional aspects; role of research, and overview of main analytical techniques currently in use. (Fall)

273 **Pre-Service Teacher Education** (3) Boswell
Program development, governance, issues, trends. (Fall, alternate years)

274 **In-Service Teacher Education** (3) Boswell
Continuing professional development of educators, costs and benefits to society, promising programs and practices, current issues. (Spring, alternate years)

275 **School Finance** (3) Brown
Educational financial theory, practice, and control, including methods of financing. (Spring)

276 **Public Relations in School Administration** (3) Brown
Purposes, gathering and developing materials, disseminating agencies, publicity media, public participation in policy-making. (Fall)

277 **Dynamics of Change in Education** (3) Boswell
An analysis of the process of cultural change in Western society with emphasis on education. Comparison of theories; analytical tools; historical precedents; the contemporary situation, prospects for the future.

278 **School Law** (3) Lilly
Sources and scope of school law; legal rights and responsibilities of teachers, pupils, and taxpayers. Other legal problems of major interest to the group. (Spring)

279 **Adult Education** (3) Wiggs
Current concepts and objectives, historical development, agencies involved, personnel, clients, programs on all levels—community through international. (Fall)

280 **Program Planning** (3) Wiggs, Luke
Determining educational needs for adults in school and non-school agencies; designing programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor. (Spring)

281 **Program Evaluation: Theory and Practice** (3) Holmes
A general introduction to the theory of program evaluation in the socio-educational setting. Overview of evaluation models, methodology associated with program evaluation, and examination of evaluation in the context of political and social environments. (Spring)

283 **Higher Education in the United States** (3) Burns
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)

284 **Administration of Higher Education** (3) Marinaccio
Government, organization, and administration of colleges and universities; duties of trustees and administrators. (Fall and spring)

287–88 **Clinical Study of Reading Problems** (3–3) Horrworth, Peterson
For advanced students. Diagnostic and corrective work under supervision. Complete case study approach; selection and evaluation

diagnostic and instructional materials and techniques for permanent file. Prerequisite: Educ 222 and 223, or 224 and 226. Material fee $10 per semester. (Academic year)

289 **Organization and Administration of Reading Programs** (3) Peterson

For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program. (Fall and summer)

290 **Severe Learning Disabilities in Reading** (3) Peterson

For experienced teachers. Case studies of children and/or adults with severe reading problems, planning and implementing instructional programs. Admission by permission of instructor. Material fee, $10. (Spring)

291 **Planning the School Plant** (3) Staff

Selection of sites; evaluation of existing buildings; utilization of present facilities; adaptation to curricular needs; building, operation, and maintenance problems. (Fall)

293–94 **Research and Independent Study** (3–3) Staff

Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

295 **Quantitative Methods II: Research Procedures** (3) Paratore, Smith, Linkowski

Required of all candidates for masters' degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent. (Fall and spring)

297 **Personnel Administration** (3) Brown

Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions. (Spring)

299–300 **Thesis Research** (3–3) Staff

Required of M.A. in Ed. degree candidates writing master's theses. (Fall and spring)

302 **Quantitative Methods III: Inferential Techniques** (3) Paratore, Smith

Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)

303 **Data Analysis** (3) Paratore

Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall and spring)

304 **Practicum in Supervision** (3 to 6) Tillman

Practical experience in supervision of instruction. Admission by permission of instructor.

305 **Internship: Supervision** (3 to 6) Staff

Service in a school situation directed by the University's faculty and school systems; integration of theory and practice.

306 **Quantitative Methods IV: Advanced Research Design** (3) Paratore, Smith
Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)

310 **Museum Studies** (3) Staff
Study of museums' functions and their educational roles. Admission by permission of instructor.

311 **Museum Audiences** (3) Brenner
Study of the many audiences of many ages who use and enjoy museums; appropriate museum practices, proposal writing.

312 **Internship in Museum Education** (6) Staff
Full-time placement in education departments in area museums. Supervision and seminar are provided by George Washington University faculty. Admission by permission of instructor.

316 **Recent Developments in Elementary School Social Studies** (3) Moore
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 **Recent Developments in Elementary School Science** (3) Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 **Recent Developments in Elementary School Mathematics** (3) Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor. (Spring)

321 **Practicum in Curriculum** (3 to 6) Staff
Supervised field experience in curriculum. Admission by permission of instructor. (Fall and spring)

322 **Internship: Reading** (3 to 6) Peterson
Limited to doctoral students in education. Experience in a selected area of college teaching. (Fall and spring)

323 **Internship: Reading** (3 to 6) Peterson
Limited to doctoral students in education. Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

324 **Teaching Reading and Study Skills at the College Level** (3) Peterson
Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 226 or equivalent, and permission of instructor. (Spring)

325 **Curriculum Theory** (3) Tillman

Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation. (Spring)

330 **Foundations of Early Childhood Education** (3) McIntyre

Historical developments, philosophy and objectives of nursery schools, kindergartens and day care centers, exploration of contemporary programs and models with curriculum implications for schools in the United States and abroad. (Fall)

332 **Early Childhood Curriculum** (3) McIntyre

Rationale, development, content, approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. (Fall)

333 **Role of the Professional in Early Childhood Education** (3) McIntyre

Planning, reporting, maintaining records, teacher-child and teacher-family interaction, diagnosis and evaluations, working with paraprofessionals and parents. Emphasis on total classroom ecology. (Spring)

334 **Community Resources and Materials for the Young Child** (3) McIntyre

Interaction with community agencies for services, resources, and equipment; physical facilities, play activities, curriculum materials, and methods for teaching the infant and young child. (Spring)

335 **Practicum in Early Childhood Education** (3 to 6) McIntyre

Supervised professional activity in selected early childhood programs; seminar. Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)

336 **Practicum in Reading** (3) Horrworth, Peterson

Supervised experience in testing and teaching. Approximately 120 class hours required. Admission by permission of instructor. (Fall and spring)

341 **Cognitive Models and Instruction** (3) Rashid

Cognitive models (Guilford, Bruner, etc.) are analyzed as the theoretical basis for planning instructional episodes appropriate at various levels—childhood through adulthood. (Fall)

342 **Language Development** (3) Rashid

Nature of language acquisition and development; emphasis on sociolinguistics and psycholinguistics most pertinent to education. (Spring)

343 **Advanced Studies in Human Development** (3) Rashid

Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation and research needs in respect to each topic discussed. Admission by permission of the instructor. (Spring)

344 **Adult Development and Aging** (3) Rashid

Theories and research on personality and cognition in adulthood and old age. Emphasis on evaluating research designs and methods, and

deriving implications of findings for gerontological programs and selected professional roles.

353 **Counseling Older Persons** (3) Staff
Special considerations and counseling emphases in regard to second careers, retirement adjustments, death and dying. (Spring)

354 **Cross-Cultural Counseling** (3) Vontress
Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States. (Spring and summer)

355 **Counseling in Groups** (3) Heddesheimer, Winkler
Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling. (Fall and spring)

356 **Counseling and the Disciplines** (3) Staff
For advanced students in counseling. Explores the psychological, sociological, economic, anthropological, and philosophical foundations of counseling. Admission by permission of instructor.

357 **Personal and Social Adjustment** (3) Winkler
Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

358 **Advanced Theories of Counseling** (3) Vontress
Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall)

360 **Job Development and Placement** (3) Lynch
Policies, principles, and processes involved in job development, modification, placement, and post-placement services, with regard to disabled persons. Admission by permission of instructor. (Spring)

361 **Medical Aspects of Rehabilitation Counseling** (3) Staff
Etiology, symptomatology, and treatment of chronic and traumatic disorders with rehabilitation counseling implications. Admission by permission of instructor. (Fall)

362 **Client Evaluation in Rehabilitation Counseling** (3) Lynch
Test and non-test methods of furthering client and counselor understanding of vocational planning. Work sample assessment, interview, and observation. Prerequisite: Educ 212 or equivalent. (Spring)

363 **Psychosocial Aspects of Rehabilitation Counseling** (3) Linkowski, Lynch
Impact of disabilities and concept of normalization with implications for rehabilitation counselors. Admission by permission of instructor. (Fall)

364 **Administration and Governance of Two-Year Colleges** (3) Greenberg
A study of the community junior college, focusing on administrative patterns and national, regional, state, and local influences, as well as

the theory and structure of two-year college organization. (Fall and spring)

365 **Foundations of Rehabilitation** (3) Linkowski, Lynch
Survey of history, philosophy, legislation, roles and services. Visits to selected field sites. (Fall)

366 **Field Work in Rehabilitation Counseling** (3) Linkowski, Lynch
Field work of two full days a week; concurrent seminar includes group supervision of clinical experience. (Spring)

367–68 **Internship: Rehabilitation Counseling** (3 to 6 each) Linkowski, Lynch
Supervised practice of three full days a week, with seminar providing integration of theory and practice. Prerequisite: Educ 365, 366. (Academic year)

369 **Professional Issues in Rehabilitation Counseling** (3) Linkowski and Staff
Culminating seminar covering professional problems and ethical issues. Prerequisite: Educ 367. (Spring)

370 **College Students and Their Community** (3) Burns
Survey of literature on the characteristics, behavior, and attitudes of the contemporary college student; college students' interaction with their environment. Admission by permission of instructor. (Fall)

371 **Principles and Practices in College Teaching** (3) Greenberg
General principles, methods, techniques and experimental instructional media for teaching at the college and university level. (Fall)

372 **Internship in Adult Learning** (3 to 6) Greenberg
Supervised experience in a selected area of college teaching. Prerequisite: Educ 371. Admission by permission of instructor. (Spring)

373 **The Community-Junior College** (3) Greenberg
The two-year college as it relates to secondary education, four-year colleges, and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges. (Fall and spring)

374 **Current Issues in Higher Education** (3) Elliott, Marinaccio
Prerequisite: Educ 283, 284. (Spring)

375 **Foundations of College Student Development** (3) Burns
College student development as an integral part of higher education programs. (Fall)

376 **Group Theories and Techniques** (3) Burns
Focus on theorists including Argyris, Blaw, Miles, Festinger, and Lewin, and practical application of theories to various organizational settings and individuals. Prerequisite: permission of instructor. (Spring)

377 **Practicum in College Student Development** (3 to 6) Burns
Supervised practical experience in college student development programs. Admission by permission of instructor. (Fall and spring)

378 Practicum in Teacher Education (3 to 6) Brenner, Boswell
For selected experienced teachers. Supervised field work relevant to students' professional needs, to be arranged. (Fall and spring)

379 Practicum in Adult Learning Programs (3 to 6) Nadler
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of instructor. (Fall and spring)

380 Sensitivity Training: Laboratory Method (3) Staff
A sensitivity learning experience in human relations using unstructured group experience, individual feedback, experimentation, and practice. Admission by permission of department, prior to registration. (Fall and spring)

381 Adult Learning (3) Wiggs, Luke
Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical and social environment in adult education situations. (Fall and spring)

382 Instructional Strategies in Adult Learning Programs (3) Nadler, Luke
Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs. (Spring)

383 Interviewing-Counseling for Human Resource Developers (3) Wiggs
Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings. (Fall)

384 Evaluation of Adult Learning Programs (3) Wiggs
Evaluation of adult learning programs in business, industry, government, voluntary and community organizations, and agencies. (Fall)

385 Collective Negotiations in Higher Education (3) Staff
Theory, practice, problems, and issues in collective negotiations in higher education.

386 Current Issues in Adult Learning Programs (3) Staff
For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission of others by permission of instructor. (Spring)

387 Administration of Adult Learning Programs (3) Staff
Program administration in school and non-school agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations. (Fall)

388 Case Studies in Higher Education Administration (3) Marinaccio
Limited to advanced doctoral students in education. Analysis of selected hypothetical cases related to essential administrative functions of colleges and universities. Admission by permission of instructor.

389 **Consultant-Client Relationships in Human Resource Development** (3) Luke

Examination of the consulting process, consultant-client behaviors, and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280; or approval of instructor. (Fall and spring)

390 **Legal Problems in Higher Education** (3) Fife

Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs. (Spring)

391 **College and University Curriculum** (3) Greenberg

Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum. (Fall)

392 **Financing Higher Education** (3) Fife

Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices. (Spring)

393 **Practicum in Higher Education** (3 to 6) Greenberg, Burns

Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor. (Fall and spring)

394 **College and University Governance** (3) Marinaccio

Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall)

395 **Problems and Practices in Educational Administrative Organization** (3 to 6) Marinaccio

Application of principles and practices concerned with change and evaluation of educational administration.

396 **Internship: Higher Education Administration** (3 to 6) Marinaccio, Greenberg

Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring)

397 **Internship: Administration** (3 to 6) Staff

Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

399 **Seminar: Applied Educational Administration** (3 to 6) Brown

Application of the theories and principles of administration to the public schools. Student participation with guidance by recognized regional practitioners.

ourth Group

master's degree from an accredited institution is prerequisite to all fourth-roup courses. All fourth-group seminars are open to doctoral candidates or her post-master's degree students with approval of instructor. Study is indi-dually planned on the basis of previous study and experience in the subject eld to attain an advanced level of competence and to meet identified profes-onal needs or field requirements.

Each of the following courses is offered fall and spring. Each course may be repeated for credit.

401 **Seminar: Western Educational Thought** (arr.) Boswell, Darland

405 **Seminar: Human Growth and Development** (arr.) Rashid

411 **Seminar: Elementary Education** (arr.) Baker

413 **Seminar: Secondary Education** (arr.) Kulaweic

421 **Seminar: Adult Education** (arr.) Wiggs

422 **Seminar: Higher Education Administration** (arr.) Marinaccio

423 **Seminar: Higher Education** (arr.) Marinaccio, Greenberg, Burns, Fife

424 **Seminar: College Student Development** (arr.) Burns

425 **Seminar: Teacher Education** (arr.) Boswell, Baker

427 **Seminar: Human Resource Development** (arr.) Wiggs

431 **Seminar: Administration, Curriculum, and Supervision** (arr.) Tillman, Lilly, Brown

443 **Seminar: Counseling** (arr.) Staff

445 **Seminar: Research and Evaluation** (arr.) Paratore, Smith

446 **Seminar: Reading** (arr.) Peterson

490 **Pre-dissertation Seminar** (3 to 6) Linkowski, Smith, Greenberg

Required of all Ed.D. degree candidates. Approval of the dissertation research design is necessary for successful completion of the seminar. Admission by permission of instructor.

491 **Dissertation Research** (arr.) Staff

Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 490.

Fifth Group

701 **Experimental Course** (3) Staff

721 **Experimental Course—Interdepartmental** (3) Staff

EDUCATION POLICY—DOCTORAL PROGRAM

Committee on Education Policy

A.V. Adams *(Chairman)*, J.R. Henig, A.D. Kirsch, C.J. Lange, M.N. Rashid, C.T. Stewart, Jr., R.A. Wallace

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of education policy. The program is directed by a committee whose members are drawn from the School of Education and Human Development and from the Departments of Economics, Philosophy, Political Science, Psychology, Sociology, and Statistics.

The scope of the program is policy research and analysis as it relates to education, broadly conceived. It is intended for those who wish to pursue or continue academic careers or careers in policy-making positions.

Required: the general requirements, pages 91–94, 99–101. Students must complete three fields of study, one of which must be education policy analysis. The remaining fields will involve concentrations in two academic disciplines chosen by the student. Courses will be selected from departmental offerings.

201–2 **Seminar: Current Issues in Education Policy** (3–3) Adams
Review of interdisciplinary literature relating to current education policy issues with emphasis on use of research and analysis in formulating and evaluating policy.

222 **Seminar: Topics in Education Policy** (3) Adams
Intensive interdisciplinary study of special topics in education policy.

290 **Advanced Studies in Education Policy** (3) Adams
Supervised interdisciplinary study and field work in a selected policy area.

399 **Dissertation Research** (arr.) Staff

ENGLISH

Professors C.D. Linton, P.H. Highfill, Jr., J.G. Allee, Jr., J.P. Reesing, Jr. *(Chairman)*, R.N. Ganz, Jr.
Adjunct Professor J.C. Broderick
Associate Professors A.E. Claeyssens, Jr., R.C. Rutledge, J.A. Quitslund, J.A.A. Plotz, J.H. Maddox, C.W. Sten, G.R. Bozzini
Assistant Professors R.L. Combs, G. Carter, G. Paster, D. McAleavey, O.A. Seavey, G.S. Spiegel, A. Romines
Adjunct Assistant Professors C.H. Hunt, F.C. Reid, S.M. Wright, C.M. Sparhawk
Assistant Professorial Lecturers E. Garner, M. Morrison, A. Blackwill, M. Dow, W. Mark, H.C. Faulkner, J. Frieman, G.B. Hayes, P.R. Laws, M.L. Lawson, S.A. Spector
nstructor M.A. Strom
djunct Instructors M. Cramer, E. Echeverria, M. Kirkland, C. Meloni, S. Thompson, J.K. Donaldson, Jr., P.A.M. Johnson, A.J. Beley, S.M. Spolarich
ecturers N. Arnesen, P. Carter, N. Kauer, D.A. Morse, J. Shapiro, J. Carroll, J. Bolz, C. Chell, F.S. Madoo, L.C. Peters, Z.B. Rosenfelt, A.R. Souder, P.V. Sullivan, J.C.B. Williams
nny McKean Moore Visiting Lecturer in Creative Writing C. Muske

Bachelor of Arts with a major in American literature or English literature eld-of-study or departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87. (Students should nsult the departmental advisor regarding courses to be taken in satisfying e requirements for meaningful initiation into the social sciences and the natu- l and mathematical sciences.)
2. Prerequisite courses—Engl 51–52 or 61–62 or 71–72 or 191–92.
3. Required courses in related areas—(a) as appropriate, 3–12 semester hours, waiver of level 4, of a foreign language (classical Hebrew, Greek, Latin,

French, German, Italian, Russian, or Spanish); (b) six semester hours of philosophy and/or religion; (c) six semester hours of history (English, American, European, or world).

4. Required for the major:

(a) *Field-of-study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199–200, and in English Literature, Engl 195–96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—30 semester hours of second-group courses offering experience with several approaches to literature which, together, make a discipline of literary study, distributed as follows:

American literature majors—Engl 120, 160, and either 161–62 or 163 and 167; three semester hours of English literature; and 15 additional hours of courses offered by the English Department, of which at least 12 hours must be in American literature.

English literature majors—Engl 120 and 194; Engl 112, 128, or 130; three semester hours of American literature; and 18 additional hours of courses offered by the English Department, of which at least 15 hours must be in English literature.

Minor in American or English literature—12 to 15 hours of second-group courses offered by the English Department, chosen in consultation with the advisor.

Master of Arts in the field of American literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English, or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements, pages 91–99, including (1) 24 semester hours of course work planned in consultation with the advisor on the basis of the student's undergraduate preparation, including a minimum of six semester hours in English literature; (2) a written Master's Comprehensive Examination; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major portion of the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Master of Arts in the field of English literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English or American literature, or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements, pages 91–99, including (1) 24 semester hours of course work, planned in consultation with the advisor; (2) a written Master's Comprehensive Examination; and (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Doctor of Philosophy in the field of American literature—Required: the general requirements, pages 91–94, 99–101; high-level proficiency in an appropriate foreign language; the passing of a General Examination in the following four fields: (1) Early American literature—to 1815, (2) 1815–1900, (3) 1900 to present, (4) a fourth field, which may be either literary or interdisciplinary. Each student plans a program in consultation with a departmental committee

Doctor of Philosophy in the field of English literature—Required: the general requirements, pages 91–94, 99–101; high-level proficiency in an appropriate foreign language; the passing of a General Examination in four of the eight following fields: 1) beginnings to 1500, linguistics, and history of the language; (2) 1500–1660; (3) 1660–1800; (4) 1800–1900; (5) 1900 to present; (6) drama, including Shakespeare; (7) criticism; (8) American literature—one of the first three fields listed above under "Doctor of Philosophy in the field of American literature." Each student plans a program in consultation with a departmental committee.

Bachelor of Arts in Education and Human Development with a teaching field in English—Prerequisite: the education curriculum, pages 114–15.
Required: the English option and the professional courses listed on page 118.

Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, reading, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores or writing skill indicate superior competence will be allowed to waive Engl 10; those whose scores indicate markedly superior competence will be allowed to waive both Engl 10 and Engl 11 or 12.

The admission of international students to any English course is determined by the English Placement Test for Foreign Students. Students should apply to the office of English for International Students to take this test (see page 26).

Departmental prerequisite: Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or written permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 160–61–62, and 191–92.

ENGLISH AS A FOREIGN LANGUAGE

First Group

20 **Intensive Basic English** (0) Bozzini and Staff

Basic grammar, reading, and vocabulary development; emphasis on oral skills. Course meets fifteen class hours and five monitored laboratory hours per week. Tuition is charged at the rate of eight semester hours; laboratory fee, $35.

30 **Intensive Lower-Intermediate English** (0) Bozzini and Staff

Introduction of complex grammatical structures, intensive reading, paragraph-level writing, and further vocabulary development and oral practice. Course meets fifteen class hours and five monitored laboratory hours per week. Tuition is charged at the rate of eight semester hours; laboratory fee, $35.

40 **Intensive Higher-Intermediate English** (0) Bozzini and Staff

Comprehensive review of grammatical structures, enlargement of vocabulary through use of unadapted and technical reading material; development of effective reading strategies; composition focusing on outlining and techniques of exposition. Twenty hours per week including laboratory. Tuition is charged at the rate of eight semester hours; laboratory fee, $35.

45 **Semi-Intensive Higher-Intermediate English** (0) Bozzini and Staff

Practice in composition writing; selective review of problematic

grammatical structures; introduction to research techniques; development of reading and speaking skills and expansion of vocabulary through use of unadapted reading materials. Ten class hours per week. Tuition is charged at the rate of five semester hours.

50 **English Composition/Research Methods for International Students** (3) Bozzini and Staff

An advanced-level composition course for international students showing a high degree of academic proficiency in English. Four class hours per week. This course can be taken by international students in lieu of Engl 9 or 10. Special fee, $25.

ENGLISH COMPOSITION

First Group

9 **English Composition: Language as Communication** (3) Claeyssens and Staff

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. Class meets five hours per week. Special fee, $25. (Fall and spring)

10 **English Composition: Language as Communication** (3) Claeyssens and Staff

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

11 **English Composition: Language and the Arts and Sciences** (3) Claeyssens and Staff

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12. (Fall and spring)

12 **English Composition: Language in Literature** (3) Claeyssens and Staff

Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and diction, and on logical thought, by the study of literary genres, and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11. (Fall and spring)

13 **English Composition: Language and Ideas** (3) Seavey, Shapiro

Study and practice of expository and argumentative techniques; emphasis on the rhetorical problems raised by different intellectual disciplines and different historical milieux. Prerequisite: Engl 9 or 10. To be taken only in conjunction with Clas/Engl/Hist/Phil/Rel 41. (Spring)

Second Group

100 **Expository Writing in Accounting** (3) Claeyssens and Staff
Special emphasis on writing related to accounting and auditing, with weekly exercises on designated topics; selected readings. Prerequisite: Engl 9 or 10; 11; junior status. (Fall and spring)

101 **Expository Writing** (3) Claeyssens and Staff
Types of expository writing; weekly exercises based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12. (Fall and spring)

102 **Introduction to Creative Writing** (3) Staff
Discussion of student poetry and/or prose fiction. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. (Fall and spring)

103 **The Writing of Fiction—the Short Story** (3) Staff
Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Fall)

104 **The Writing of Poetry** (3) Staff
Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration.

105–6 **The Writing of Plays** (3–3) Claeyssens
Same as SpDr 105–6. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration. (Academic Year)

107 **The Writing of Fiction—the Novel** (3) Claeyssens
Prerequisite: Engl 102 or 103; consent of instructor. The student should submit a writing sample to the instructor before registration. (Spring)

108 **Advanced Creative Writing** (3) McAleavey
Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration.

110 **Expository Writing for the Professions** (3) Strom
Weekly exercises based on students' individual needs; particular attention given to problems in writing for technically sophisticated readers. Selected readings. (Fall and spring)

Third Group

201–2 **The Teaching of Composition** (3–3) Spiegel
(Academic year)

ENGLISH LITERATURE

First Group

41 **Roots of the Western Tradition** (3) Staff
Same as Clas/Hist/Phil/Rel 41. Basic ideas of western thought from early Greek, Roman, Judaic, and Christian traditions. Representative

readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. To be taken in conjunction with Engl 13. (Spring)

51–52 **Introduction to English Literature** (3–3) Rutledge and Staff
Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature. (Academic year)

61 **Tragedy** (3) Carter
Modes of tragedy as developed in drama, nondramatic verse, and prose fiction in literature from ancient to modern times—Book of Job to Beckett. (Fall)

62 **Comedy** (3) Carter
Modes of comedy as developed in drama, nondramatic verse, and prose fiction—Chaucer to Borges. (Spring)

Second Group

111 **Medieval English Literature—Exclusive of Chaucer** (3) Allee

112 **Chaucer** (3) Allee
(Spring)

115 **History of the English Language** (3) Allee
(Formerly Introduction to English Linguistics)
Development of the English language in a historical treatment of English grammar. (Fall)

116 **Medieval Legend and Saga** (3) Allee
Celtic and Norse.

120 **Practical Criticism** (3) Plotz
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

123 **Principles of Literary Criticism** (3) Carter
Works of major critics; consideration of ways in which literature is analyzed, classified, judged, and justified; Aristotle, Longinus, Dryden, Johnson, Coleridge, Schiller, Arnold, Eliot, Richards, Frye.

125–26 **Elizabethan Verse and Prose** (3–3) Quitslund
(Academic year)

127–28 **Shakespeare** (3–3) Highfill
Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Earlier 17th Century** (3) Reesing
Poetry and prose to 1660, exclusive of Milton.

130 **Milton** (3) Reesing

131–32 **English Literature, 1660-1780** (3–3) Highfill
Poetry and prose of the Neoclassic period. Engl 131: 1660–1740. Engl 132: 1740–1780.

133–34 **The Romantic Movement** (3–3) Plotz
Engl 133: Blake, Wordsworth, Coleridge. Engl 134: Byron, Shelley, Keats. (Academic year)

135–36 **Victorian Literature** (3–3) Carter
Engl 135: Tennyson, Browning, Arnold; Dickens; Carlyle, Ruskin. Engl 136: George Eliot, Browning, Tennyson, Swinburne, Hardy, Hopkins, Wilde, Pater. (Academic year)

137–38 **The 20th Century** (3–3) Linton
Literature since 1900. Engl 137: poetry and criticism. Engl 138: drama and the novel. (Academic year)

145–46 **Special Topics in English Literature** (3–3) Carter, Rutledge
Each course may be repeated for credit. (Academic year)

147–48 **Special Topics in English Literature** (3–3) Maddox
Each course may be repeated for credit. (Engl 147—fall)

149 **The Romantic Movement** (3) Combs
Poetry and prose, 1780-1830. Students who receive credit for Engl 149 cannot receive credit for Engl 133 or 134.

153–54 **The English Novel** (3–3) Maddox
Major novelists. Engl 153: 18th century. Engl 154: 19th century. (Academic year)

155–56 **The English Drama** (3–3) Paster, Highfill
Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present.

157 **20th-Century Drama** (3) Paster
Representative continental, English, and American plays of the 20th century.

158 **20th-Century British Prose Fiction** (3)

191–92 **Introduction to European Literature** (3–3) Seavey
Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid;* dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann. Open to freshmen and sophomores. May be taken to satisfy the requirement for meaningful initiation into the humanities. (Academic year)

194 **History of English Literature** (3) Reesing
(Spring)

195–96 **Proseminar in English Literature** (3–3) Quitslund
For field-of-study majors in English literature. Themes and concerns basic to the English literary tradition, which draw connections between diverse works from the Old English period to recent times. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major in English literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)

Third Group

212 **Studies in Chaucer** (3) Allee

213 **Old English** (3) Allee
Old English grammar and readings.

214 **Beowulf** (3) Allee
Prerequisite: Engl 213 or equivalent.

219 **Research Methods and Bibliographical Materials** (3) Broderick
Principal bibliographical sources and typical problems in research. (Fall)

223–24 **Studies in Literary Criticism** (3–3) Plotz

225–26 **Studies in 16th-Century English Literature** (3–3) Quitslund
(Engl 226—spring)

227–28 **Studies in Shakespeare and his Contemporaries** (3–3) Paster

229 **Studies in English Literature, 1600-1660** (3) Reesing
Chief figures exclusive of Milton. (Fall)

230 **Studies in Milton** (3) Reesing

231–32 **Studies in English Literature, 1660–1780** (3–3) Highfill

233–34 **Studies in the Romantic Movement** (3–3) Plotz
(Engl 233—fall)

235–36 **Studies in Victorian Literature** (3–3) Carter

237–38 **Studies in 20th-Century Literature** (3–3) Linton
(Engl 238—spring)

253–54 **Seminar: The English Novel** (3–3) Maddox
(Engl 254—spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the English Department.

301–308 **Folger Institute Seminars** (3 credits each) Staff
Topics will be announced.

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

First Group

71–72 **Introduction to American Literature** (3–3) Ganz and Staff
Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present. (Academic year)

Second Group

120 **Practical Criticism** (3) **Plotz**
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

160-61-62 **Studies in American Literature** (3–3–3) **Seavey, Sten**
Same as AmCv 160–61–62. Major factors in the national cultural tradition as shown by outstanding writers. (Engl 160, 162—fall; 161—spring)

163–64 **Major American Poets** (3–3) **Ganz**
Advanced critical study of significant writers and movements. Engl 163: From beginnings through the 19th century. Engl 164: The 20th century. (Academic year)

165–66 **American Drama** (3–3) **Combs, Claeyssens**
Historical and critical study of significant plays and forms. Engl 165: From beginnings to 1930. Engl 166: Since 1930. (Academic year)

167–68 **The American Novel** (3–3) **Sten, Maddox**
Historical and critical study of significant novels. Engl 167: From beginnings through the 19th century. Engl 168: The 20th century. (Academic year)

170 **The American Short Story** (3) **Combs**
Historical development of the American short story. (Spring)

171–72 **Major American Writers** (3–3)
Each course may be repeated for credit.

173–74 **Selected Literary Movements** (3–3) **Plotz**
Each course may be repeated for credit. (Engl 174—spring)

175–76 **Special Topics in American Literature** (3–3) Romines, Seavey
Each course may be repeated for credit. (Fall)

177–78 **Contemporary American Literature** (3–3) Ganz, Claeyssens
Major and representative works since World War II. (Academic year)

181–82 **TBA** TBA

Two special courses offered each year by the Jenny McKean Moore Visiting Lecturer in Creative Writing. Each course may be repeated for credit. (Academic year)

197 **Independent Study** (3) Reesing and Staff

Open to honors candidates in the field-of-study major in American literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff

Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in American literature. (Fall and spring)

199–200 **Proseminar in American Literature** (3–3) Sten

For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

Third Group

219 **Research Methods and Bibliographical Materials** (3) Broderick

Principal bibliographical sources and typical problems in research. (Fall)

263–64 **Studies in American Poetry** (3–3) Ganz

(Engl 263—fall)

267–68 **Seminar: American Fiction** (3–3) Maddox

Research and critical reading: fiction and the criticism of fiction. (Engl 268—fall)

281–82 **Seminar: Early American Literature** (3–3) Seavey

(Engl 282—spring)

283–84 **Studies in American Romanticism** (3–3) Broderick

Engl 283: Melville—the early fiction. Engl 284: Emerson, Thoreau, and the Concord Group: the intellectual background and the literary achievement. (Engl 283—spring)

285–86 **Seminar: American Literature, 1865-1900** (3–3) Sten

Realism in America. (Engl 285—spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ENVIRONMENTAL STUDIES

Committee on Environmental Studies

A.K. Fitzsimmons *(Chairman)*, O. Bergmann, R.S. French, R.W. Kenny, R.C. Lindholm, H. Merchant, C.T. Perin, W.E. Schmidt, A.M. Yezer

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. The program leading to the degree of Bachelor of Arts is designed for the student who is oriented toward participating in environmental decision-making with emphasis on the perspective of the social sciences. The program leading to the degree of Bachelor of Science is designed for the student with well-developed interests in science who seeks professional identification as a field or laboratory worker in the environmental sciences.

Bachelor of Arts with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):
   (a) Statistics—Stat 91.
   (b) Natural sciences—six to eight semester hours selected from BiSc 3–4, 11–12; Chem 11–12; Geol 1–2, 21–22; or Phys 1, 2. Courses designated for non-science majors must be passed with a grade of *A* or *B* to be accepted toward fulfilling the introductory natural science requirement. This includes BiSc 3–4 and Geol 1–2.
   (c) Social sciences—12 semester hours selected from Anth 1–2; Econ 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; or Soc 1, 2.
3. Required courses in the major (48 semester hours):
   (a) BiSc 140 (four semester hours).
   (b) Eight semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 111, 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 185, 208, 210, 211, 237, 242; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 163, 181, 272; Phys 6, 14, 15, 16, 27–28.
   (c) 30 semester hours in courses selected from *two* departments in the following—Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 136, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 132, 134, 135, 136, 137, 140, 142, 143, 145, 221, 222; PSc 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.
   (d) Envr 151–52 (six semester hours).

Bachelor of Science with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):
   (a) Statistics—Stat 91.
   (b) Natural sciences—12 to 16 semester hours selected from BiSc 11–12; Chem 11–12; Geol 21–22; Phys 1, 2. Either BiSc 11–12 or Chem 11–12 must be selected.
   (c) Social sciences—12 semester hours selected from Anth 1–2; Econ 1–2; Geog 1, 2, 3; PSc 1, 2; Psyc 1, 5–6; Soc 1, 2.
3. Required courses for the major (48 semester hours):
   (a) BiSc 140 (four semester hours).

(b) 20 semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 111, 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 185, 208, 210, 211, 237, 242; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 163, 181, 272; Phys 6, 14, 15, 16, 27–28.

(c) 18 semester hours selected from Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 136, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 132, 134, 135, 136, 137, 140, 142, 143, 145, 221, 222; PSc 104, 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.

(d) Envr 151–52 (six semester hours).

The science and social science courses listed under 3(b) and 3(c) above must be taken in not more than *three* departments. Not more than six hours of service-learning course may count toward fulfilling requirements of the major.

In choosing elective courses for both the Bachelor of Arts and Bachelor of Science degree programs, students are reminded that permission of the Dean of Columbian College of Arts and Sciences and the Committee on Environmental Studies is necessary to take courses not offered by Columbian College of Arts and Sciences, and that a maximum of 12 semester hours of such courses may be taken. The following may be of interest to the environmental studies major: BAd 101, 171, 201, 203; *CE 194, 197; HKLS 152; U&RP 153, 201, 205. The permission of the instructor, the department chairman, and the Dean of the School of Government and Business Administration is necessary to take graduate courses (numbered 201 and above) in that School.

151–52 Senior Seminar in Environmental Studies (3–3) Staff

Limited to majors in environmental studies. Directed reading and discussion of contemporary environmental problems.

157 Introduction to Environmental Law (3)

An introduction to selected pieces of major environmental legislation. The role of the courts and bureaucracy in implementing and interpreting legislation. Impact on decision-making. Designed for students with no training in law.

158 Special Topics in Environmental Law (3)

Analysis of environmental laws which focus on a particular environmental issue. Topics will vary. Prerequisite: Envr 157 or permission of instructor.

159–60 Field Experience (3–3)

Open to juniors and seniors majoring in environmental studies. Students will spend at least eight hours per week in a political, technical, legal, or special interest organization working on environmental questions.

EXPERIMENTAL HUMANITIES†

Professor W.E. Schmidt
Associate Professors R.S. French, A.E. Claeyssens, Jr., W.C. Parke
Adjunct Associate Professor L.J. Lear *(Coordinator)*
Assistant Professors D.J. Lynn, S.R. Lichter
Adjunct Instructor L.P. Love

* See the *School of Engineering and Applied Science Bulletin* for civil engineering courses.
† Administered by the Division of Experimental Programs.

EXPERIMENTAL HUMANITIES

First Group

2–3 **Politics and Values** (3–3) Lichter

A freshman course; limited enrollment. Students will be housed in Thurston Hall. Field-study and case-study of value conflicts implicit in selected political issues involving federal policy and legislation. Concurrent registration in special sections of PSc 2 and 3 required. Students registering for Hum 2 in the fall semester will be expected to register for Hum 3 in the spring semester. Admission by permission of instructor. (Fall and spring)

26 **Environmental Issues** (3) French

An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Spring)

40 **Washington, D.C.: Culture and Politics** (3) Lear and Interdisciplinary Team

An all-university course designed primarily for freshmen and transfer students. Major facets of metropolitan life, past and present, analyzed by faculty, students, and community leaders. (Fall)

91 **The Creative Process** (3) Claeyssens and Interdisciplinary Team

The process of invention in the fine and popular arts is studied in Hum 91 through exchanges with practicing artists at their rehearsals and studios and through class discussions with visiting artists and critics. Examination of documents in which artists in various fields discuss work in progress. Professors of drama, dance, film, art, and English participate. (Academic year)

Second Group

101 **Supervised Field Study** (6) French

Community-based projects supervised by appropriate faculty. Juniors and seniors admitted by permission of instructor. (Fall and spring)

171 **The Legal Process** (3) Love

The function which law plays in society and the nature of the legal process. Examination of the societal assumptions and values that mold the law. Emphasis upon institutions that make up the law—the courts, administrative agencies, legislative bodies, and executive agencies. Open only to juniors and seniors by permission of instructor. (Academic year)

174 **Science and Values** (1 or 3) Schmidt, Parke

Study of the effects of scientific knowledge and technology on social institutions and the image of man, of the question of ethics and morality in science, and of the science of values. Admission by permission of instructor.

198 **Conference on Policy Studies and the Humanities** (3) Lynn

Examination of a selected policy issue (e.g., health care, freedom of information, drug abuse) in relation to alternative social goals. Open

to graduate, law, and medical students, as well as advanced undergraduates by permission of instructors.

SERVICE-LEARNING EXPERIMENTAL HUMANITIES

See **Service-Learning Program.**

FORENSIC SCIENCES—GRADUATE PROGRAMS

Professors T.P. Perros, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear *(Chairman)*
Adjunct Professor C.G. McWright
Professorial Lecturers B.J. White, C.B. Cunningham, L.R. Goldbaum, R.L. Thompson, E.G. Howe
Associate Professors N.T. Lappas, W.F. Rowe
Associate Professorial Lecturers J.T. Smith, G.M. Saiger, R.S. Bennett, C.E. Bohn, J.L. Melnick, K.E. Melson, H.F. Schuelke III, L.H. Wechsler, D.S. Dixon, R.H. Parker, J.P. Hume, B.W. Given, S.H. Manne
Assistant Professorial Lecturers N.R. Janis, M. Stajic, J.L. Lyons, G.M. Richman, R.I. Richter, E.D. Ross, Jr., D. Beard, J. Blumenfeld, R.B. Schulman, J. Harris, M.M. Levy, S.R. Lorigo, M.G. Yeager

Master of Forensic Sciences—Prerequisite: a bachelor's or a graduate degree from an accredited institution of higher learning and academic or professional experience in the behavioral, biological, or physical sciences, or law, medicine, or law enforcement.

Required: the general requirements, pages 91–99. For students not electing a thesis, 36 semester hours of course work are required; for students electing a thesis, 30 semester hours of course work, plus a thesis (equivalent to six semester hours), are required. ForS 220, 221, 224, and 225 are required of all students. ForS 224 may be waived for students having an LL.B. or J.D. degree from an accredited law school. The following are also required: (1) nine hours selected from ForS 201, 202, 203, 204, and 205; (2) nine hours selected from ForS 214, 260, 261, 265, and 269; (3) the remaining semester hours must be selected in consultation with the advisor from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

Master of Science in the field of chemical toxicology—Prerequisite: completion of the first three years of the combined B.S./M.S. program in chemical toxicology (see Chemistry Department) or its equivalent. Courses may be required to remove academic deficiencies.

Required: the general requirements, pages 91–99. The following courses are required: Bioc 221–22; Phyl 191; Phar 203; ForS 240, 242, 245; two courses selected from ForS 246, 248, 249, 269; ForS 299–300 or Chem 299–300. Chem 131, 141, 142 and Stat 127 will be required of students who have not had these courses or their equivalent. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

Master of Science in Forensic Science—Prerequisite: a bachelor's or graduate degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements, pages 91–99. The program of study consists of 30 semester hours of course work, plus a thesis (equivalent to six semester hours). Individualized programs of study will be developed to meet

the career objectives of each student. Students may specialize in forensic chemistry, toxicology, or serology. Each such program of study must include ForS 224 and 225. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. Candidates must also fulfill the tool requirement by passing a reading knowledge examination in French, German, or Russian, or by satisfactorily completing the tool requirement in either statistics or computer programming.

Master of Arts in Special Studies—Prerequisite: a bachelor's or graduate degree from an accredited college or university.

a) *With a concentration in Criminal Justice*—

Required: the general requirements, pages 91–99. The program of study consists of 36 semester hours of approved course work drawing from the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 214, 220, 221, 224, 225, 228, 265, 266, 274, 290; Soc 259, 261 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

b) *With a concentration in Crime in Commerce*—

Required: the general requirements, pages 91–99. The program of study consists of 36 semester hours of approved course work drawing upon the forensic sciences, law, accounting, computer science, investigative techniques, and management. ForS 203, 224, 225, 229, 232, 233, 234, 235, 251, 267, 274, and Stat 197 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

The interdisciplinary programs leading to the degrees of Master of Arts in Special Studies, Master of Forensic Sciences, and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, from the National Law Center, from the School of Medicine and Health Sciences, and graduate course work in the behavioral, biological, and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology in a program of mutual exchange among students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

201 Forensic Serology I (3) Lappas

Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology. Laboratory exercises.

202 Instrumental Analysis (3) Perros, Rowe

Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry. Laboratory exercises.

203 Examination of Questioned Documents (3) Bohn

Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.

204 **Firearms and Tool-mark Identification** (3) Cunningham, Row
Methods for identifying firearms, cartridge casings, tool-marks, tir
marks, and footprints. Laboratory exercises.

205 **Personal Identification** (3) Give
Methods of personal identification based on sketches, fingerprint
voiceprints, odontology, and study of skeletal remains.

214 **Forensic Psychiatry** (3) Howe, Saiger, Smith, Mann
Introduction to the constructs of dynamic psychiatry, psychiatri
treatment, and the nomenclature of mental disorders. Considerations
of expert testimony, direct examination, and cross-examination in
hospitalization and criminal cases.

220 **Physical Aspects of Forensic Sciences** (3) O'Rear, Rowe
Survey of forensic physical sciences; fingerprints, firearm and tool-
mark examinations, document examinations, and examinations of
trace evidence such as glass, soil, paint, hairs, and fibers; crime scene
investigations; qualifications and preparation of expert witnesses;
operation and functioning of the forensic science laboratory.

221 **Biological Aspects of Forensic Sciences** (3) Lappas, Rowe
Principles of forensic pathology, serology, and toxicology. The role
of the forensic laboratory in the identification of human remains; de-
termination of the time, cause, and manner of death; partial indi-
vidualization of biological materials; and the detection of drugs in
biological materials.

224 **Criminal Law I** (3) Starrs, Hume, Beard, Schulman
Principles of criminal law and procedure, preparation and presenta-
tion of evidence, examination of witnesses, and methods of legal
research.

225 **Criminal Law II: Evidence** (3) Melson, Melnick, Janis
Procedural rules affecting the collection and use of physical evi-
dence. Emphasis on court opinions defining the rules of search and
seizure and admissibility of evidence. Prerequisite: ForS 224.

227 **Criminal Law III: Procedure** (3) Schuelke, Wechsler
Decision to arrest, prosecutive discretion, bail, the preliminary hear-
ing, right to a speedy trial, discovery, plea bargaining, publicity,
post-conviction procedures. Prerequisite: ForS 224.

228 **Administration of Criminal Justice** (3) Schulman, Richman
Consideration and analysis of selected advanced problems in the
administration of criminal justice. Emphasis on the role and profes-
sional responsibilities of prosecutor and defense counsel and on de-
velopmental trends in the law. Prerequisite: ForS 224.

229 **Criminal Law IV: Contracts** (3) Harris
Concepts and principles of law encountered in commercial activities:
contracts, sales, negotiable instruments, and bankruptcy. Emphasis
on recognition of deceptive contracting practices. Statutes and gov-
ernment regulation governing contracts.

232 **Crime in Commerce I: Accounting** (3) Levy, Lorigo
Principles of accounting; abuse and misuse of accounting pro-
cedures; use of accounting in the investigation of commercial crime.

233 **Crime in Commerce II: Procurement and Supply** (3) Levy, Lorigo
Governmental and private sector procurement procedures; techniques of inventory management; abuse of procurement procedures and illicit diversion of supplies.

234 **Crime in Commerce III: Information Systems** (3) Staff
Principles of management information systems; security of information system and facilities; compromising of information systems.

235 **Crime in Commerce IV: Conspiracy** (3) Leibowitz
Legal definition of conspiracy; quantum of proof; use of investigative techniques to establish the existence of criminal conspiracies.

240 **Principles of Toxicology** (4) Lappas
Concepts of toxicology including its historical development and modern applications, drug disposition, mechanisms of toxicity; factors which influence toxicity and toxicity evaluation.

242 **Chemistry of Organic Medicinal Agents** (3) O'Rear
A correlated study of the compostion, constitution, physical and chemical properties and pharmaceutical uses of organic medicinal agents. Included are discussions of the heterocyclic chemistry of these agents.

245 **Analytical Toxicology** (4) Lappas
A study of qualitative and quantitative principles and procedures used in the detection, identification, isolation, purification and potency determination of drugs. Laboratory.

246 **Environmental Toxicology** (3) Staff
A study of the chemical substances to which humans are unintentionally exposed. Emphasis will be placed on pesticides, food additives and air pollutants.

248 **Clinical Toxicology** (3) Staff
A study of the adverse effects caused by or related to the use of drugs. The signs and symptoms, diagnoses and treatments will be emphasized.

249 **Industrial Toxicology** (3) Staff
A study of the potential hazards encountered by workers as a result of their exposure to raw materials, intermediates and finished products. The types of exposure and methods of predicting and preventing toxic exposure will be emphasized.

250 **Interdisciplinary Aspects of Forensic Science** (3) Starrs, Blumenfeld
Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibility of evidence, class evidence vs. individualized evidence, and search and seizure. Prerequisite: ForS 224.

251 **Moot Court** (3) Janis, Wechsler
Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc. Prerequisite: ForS 224.

254 **Selected Topics in the Forensic Sciences** (3) St
Current issues in research, investigation, and law.

260 **Principles of Forensic Medicine** (3) Thompson, Muell
Anatomy and physiology of the human body with emphasis on unde standing the processes underlying traumatic and unexpected deat encountered in forensic pathology. Bone growth and repair as relates to child abuse, structure and functions of the heart relati to sudden death, and anatomic area of the brain prone to hemo rhagic lesions following trauma.

261 **Principles of Forensic Pathology** (3) Thompson, Wagne
Terminology and scientific techniques used in medico-legal investig tions, sudden or unexpected deaths, homicides, suicides, accident deaths, and trauma.

265 **Drugs of Abuse** (3) Lappas, O'Rear, Staji
Chemical, pharmacological, toxicological, and pathological character istics of commonly abused drugs, including ethanol, barbiturates, nar cotics, stimulants, and hallucinogens. Primarily for M.A. in Sp.Std degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear, Yeager
Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

267 **Seminar: Crime in Commerce** (3) Staff
Interdisciplinary course in current problems in the investigation and prosecution of commercial offenses.

268 **Photography in the Forensic Sciences** (3) Thompson
Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close-up work, and common misconceptions. Laboratory fee, $25.

269 **Forensic Toxicology I** (3) Lappas
Relevant underlying biological, chemical, and pharmacological prin ciples of forensic toxicology.

270 **Medicinal Chemistry** (3) O'Rear
Theory and principles of classification, synthesis, and structure activity relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.

271 **Forensic Serology II** (3) Lappas
Methods in forensic serology. Laboratory examinations and classi fications of dried blood and other biological materials. Independent laboratory projects. Laboratory fee, $25. Prerequisite: ForS 201, or permission of instructor.

272 **Forensic Toxicology II** (3) Lappas
Lectures, student seminars, laboratory exercises, and projects dealing with topics of current interest in forensic toxicology. Prerequisite: ForS 269 or permission of instructor. Laboratory fee, $25.

273 **Forensic Chemistry I** (3) Rowe

Examination of glass, soils, hairs, and fibers. Laboratory exercises include refractive index measurements using immersion methods; polarized light observations of minerals, hairs, and fibers; elemental analysis of glass and soil by spectroscopic methods; x-ray diffraction analysis of minerals; and classical chemical and physical methods of analysis. Prerequisite: ForS 202 or permission of instructor. Laboratory fee, $25.

274 **Management of Criminal Justice Organizations** (3) O'Rear, Parker

Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.

280 **Forensic Chemistry II** (3) Rowe

Examination of arson accelerants, textile fibers, plastics, and paints. Laboratory exercises include infrared spectrophotometry and pyrolysis—gas-liquid chromatography of polymeric materials, as well as classical chemical and physical methods of analysis. Prerequisite: ForS 273. Laboratory fee, $25.

290 **Research in Criminal Justice** (3) Courtless

An examination of the role and process of research as it serves the criminal justice systems. Presentations and discussions of the literature with emphasis on the use of research and analysis in formulating and evaluating criminal justice policy.

295 **Research** (arr.) Staff

Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

FRENCH

See **Romance Languages and Literatures.**

GENERAL CURRICULUM IN THE LIBERAL ARTS

Bachelor of Arts: General Curriculum in the Liberal Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. *Humanities*—39 semester hours:
   (a) 6 semester hours selected from Engl 9 or 10, 11 or 12, 101.
   (b) 18 semester hours (of which 6 semester hours must be in a foreign language) selected from Chin 163–64; Clas 71, 72, 108, 113; Engl 51–52, 61–62, 71–72, 127–28, 153–54, 155–56, 160 in combination with 161 or 162, 163–64, 165–66, 167–68, 170, 191–92; Fren 51–52, 60 in combination with 51 or 52, 91–92; Ger 51–52, 103–4, 111–12, 126, 161–62; Slav 91–92; Span 51–52, 91–92.
   (c) 6 semester hours selected from Phil 111, 112, 113.
   (d) 3 semester hours selected from Rel 9, 10, 21, 59, 60, 103, 104, 105, 107, 111, 113, 114, 115, 116, 126, 137, 143, 144, 145.
   (e) 6 semester hours selected from Art 1, 31–32, 71–72, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122,

140, 145, 147, 148, 149, 150, 155, 156, 161, 162, 165, 167, 169–70; Mus 3, 4, 7, 101–2, 103–4, 109, 110, 121, 125; SpDr 45, 49, 126, 143, 144, 165–66.

3. *Social Sciences*—18 semester hours:

(a) 6 semester hours selected from Hist 108, 109, 110, 111–12, 121, 122, 123–24, 171–72, 175–76, 179–80, 183.

(b) 6 semester hours selected from courses in economics; or 6 semester hours selected from courses in political science.

(c) 6 semester hours selected from courses in American civilization, anthropology, geography and regional science, psychology, or sociology.

4. *Natural and Mathematical Sciences*—18–22 semester hours:

(a) 6–8 semester hours in each of two laboratory sciences selected from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2 or 21–22; Phys 1–2 or 9–10.

(b) 6 semester hours selected from courses in mathematics (excluding Math 3 and 6).

5. *Electives*—41 semester hours of courses selected in consultation with the advisors.

A major is optional. If a student chooses a major, elective courses may be used to fulfill the requirements for it.

The requirement of 6 semester hours of literature in a foreign language may be fulfilled by selection from any of the first- or second-group foreign-language courses in literature. The requirement presupposes foreign-language competency, which a student may achieve, if necessary, through elective courses.

A student must pass a minimum of 45 semester hours of second-group courses. By passing an examination administered or authorized by the appropriate department, a student may waive introductory courses that are prerequisite to more advanced courses.

GENETICS—GRADUATE PROGRAMS

Committee on Genetics

S.O. Schiff *(Chairman)*, W.F. Anderson, A.M. Attallah, D. Brusick, R. Crystal, R.F. De Giovanni-Donnelly, E.M. Earley, R.C. Gallo, C.B. Jacobson, D. Johnson, K.E. Johnson, P.D. Kind, K. Krell, J.W. Larsen, W.M. Leach, R. Mage, C.R. Merril, A. Mescher, W.G. Nash, S. O'Brien, J.C. Petricciani, D. Picciano, K.N. Rosenbaum, M. Schanfield, J. Schlom, K. Todaro

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Anatomy, Biochemistry, Biological Sciences, Microbiology, Obstetrics and Gynecology; and from government agencies and private industry.

A baccalaureate degree and acceptable Graduate Record Examination scores are required for admission to the degree program. The undergraduate program must have included the following: eight semester hours each in biology, inorganic chemistry and organic chemistry; six semester hours in physics; and six semester hours in English composition and literature. While not required for admission, courses in embryology, genetics, and mathematics are strongly recommended.

Master of Science in the field of genetics—Required: the general requirements, pages 91–99. The 30 semester hours required in this program must include Gnet 201 and Gnet 299–300. The remaining 22 semester hours of course work are to be selected, with the approval of the Committee on Genetics, from the departmental courses listed below. The tool requirement may be met by

satisfactorily completing an approved course in biostatistics or by passing a foreign language reading examination.

Doctor of Philosophy in the field of genetics—Required: the general requirements, pages 91–94, 99–101. The program of study must include Gnet 301, eight to 10 semester hours of biochemistry, six to eight semester hours of cell biology, 10 to 12 semester hours of genetics, and two or three semester hours of statistics. These courses may be selected from the departmental listings below. The tool requirement may be met by the satisfactory completion of an approved course in biostatistics and the passing of a foreign language reading examination, preferably in French or German.

GENETICS

Third Group

201 **Advanced Problems in Genetics** (2) **Staff**
Lectures on selected topics by members of the Committee on Genetics. Required of all master's degree candidates in the Genetics Graduate program. (Fall)

295 **Research** (arr.) **Staff**
Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Academic year)

Fourth Group

301 **Advanced Problems in Genetics** (2) **Staff**
Lectures on selected topics by members of the Committee on Genetics. Required of all Ph.D. candidates in the Genetics Graduate program. (Fall)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANATOMY

203 *Human Embryology* (1)
260 *Electron Microscopy in Cellular Biology—Lecture* (1)
261 *Transmission Electron Microscopy* (3)

BIOCHEMISTRY

221–22 *General Biochemistry* (3–4)
229 *Biochemistry of Enzymes* (1)
232 *Protein Chemistry I* (1)
233 *Protein Chemistry II* (1)
241 *Isotopes* (3)

250 *Cell and Molecular Biology* (2)
266 *Biochemical Genetics and Inherited Metabolic Diseases* (2)

BIOLOGICAL SCIENCES

Biology

111 *Introductory Microbiology* (4)
122 *Cell Biology* (3)
123 *Cell Biochemistry* (3)
124 *Cell Biochemistry Laboratory* (2)
127 *Genetics* (3)
128 *Genetics Laboratory* (1)
138 *Advanced Genetics* (3)
167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)
220 *Seminar: Cell or Plant Biochemistry* (3)
227 *Seminar: Genetics* (3)
228 *Population Genetics* (3)
229 *Cytogenetics* (3)
230 *Human Genetics* (3)
248 *Analysis of Development* (3)
249 *Seminar: Developmental Biology* (3)

Zoology

145 *Introduction to Vertebrate Embryology* (4)
146 *Experimental Developmental Biology* (4)
212 *Seminar in Comparative Reproductive Biology* (3)

MICROBIOLOGY

211 *Microbiology* (4)
214 *Tissue Cell Culture and Somatic Variation* (3)
219 *Scientific Writing* (1)
229 *Immunology* (3)
230 *Immunology Laboratory* (2)
231 *Immunobiology* (1)
233 *Virology* (3)
234 *Virology Laboratory* (2)
258 *Microbial Genetics* (2)
260 *Cellular Immunology* (1)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology* (3)
222 *Genetic Toxicology* (2)
256 *Molecular Pharmacology* (2 or 3)
258 *Cancer Chemotherapy* (1)

STATISTICS

91 *Principles of Statistical Methods* (3)
127 *Statistics for the Biological Sciences* (3)
153–54 *Mathematical Models in Population Genetics* (3–3)

GEOBIOLOGY—GRADUATE PROGRAMS

Committee on Geobiology

A.G. Coates *(Chairman)*, M.A. Buzas, R.E. Knowlton, H. Merchant, R.P. Seifert

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of geobiology. The program is directed by a committee whose members are drawn from the Departments of Biological Sciences, Geography and Regional Science, and Geology. It is enhanced by cooperative relationships with the Smithsonian Institution and U. S. Geological Survey.

A baccalaureate degree in biology, botany, geology, or zoology from this University, or an equivalent degree from another accredited institution of higher learning, is required for admission to the program. Prerequisite University courses (or equivalent courses elsewhere) include the following: BiSc 101 or 104, 108, 127, 140; Geol 22, 151 or 154, 166; Stat 91.

Master of Science in the field of geobiology—Required: the general requirements, pages 91–99. The program includes 30 semester hours of course work, plus a thesis (equivalent to six semester hours). Required courses include BiSc 107, 208, 209; Geol 195, 254, and 255. Electives are selected from the following (to total, with the required courses, at least 30 semester hours): BiSc 102, 103, 105, 106, 110, 138, 141, 143, 144, 162, 204, 207, 211, 228, 229, 237, 242, 243; Geog 104, 106, 108; Geol 105, 125, 128, 152, 154, 158, 163, 175, 181, 241, 258, 263, 266.

Doctor of Philosophy in the field of geobiology—Required: the general requirements, pages 91–94, 99–101. The program includes 48 semester hours of course work, plus a dissertation (equivalent to 12 semester hours). Required courses include: BiSc 107, 208, 209, 211, 228; Geol 125, 195, 254, 255, 263. Electives are to be selected from remaining elective courses listed for the master's degree (to total, with the required courses, at least 48 semester hours).

Research fields: animal ecology, evolution, genetics, geomorphology, hydrology, invertebrate zoology, invertebrate paleontology, lower plants, marine ecology, marine biology, meteorology, micropaleontology, paleoecology, plant ecology, sedimentary geology, stratigraphy, vertebrate paleontology, vertebrate zoology.

BIOLOGICAL SCIENCES

Biology

103 *Marine Biology*
107 *Field Biology*
138 *Advanced Genetics*
144 *Aquatic Ecology*
208 *Bioenergetics*
209 *Seminar: Principles and Mechanisms of Organic Evolution*
228 *Population Genetics*
229 *Cytogenetics*
243 *Seminar: Ecology*

Botany

105 *Field Biology of Woody Plants*

106 *Field Botany—Lower Plants*
110 *Comparative Plant Morphology*
141 *Plant Ecology*
242 *Seminar: Plant Ecology*

Zoology

102 *Advanced Invertebrate Zoology*
143 *Animal Ecology*
162 *Insect Population and Evolutionary Biology*
204 *Seminar: Invertebrate Zoology*
211 *Adaptation and Natural Selection*

GEOGRAPHY

104 *Special Techniques in Cartography*
106 *Introduction to Remote Sensing*
108 *Climatology*

GEOLOGY

105 *Geological Hazards in Land-Use Planning*
125 *Marine Geology*
128 *Geomorphology*
152 *Invertebrate Paleontology*
154 *Vertebrate Paleontology*
158 *Micropaleontology*
163 *Sedimentation*
175 *Hydrogeology*
181 *General Oceanography*
195 *Field Work*
241 *Marine Geochemistry*
254 *Evolutionary Paleobiology*
255 *Quantitative Paleoecology*
258 *Seminar: Micropaleontology*
263 *Sedimentary Environments*
266 *Advanced Stratigraphy*

GEOGRAPHY AND REGIONAL SCIENCE

Professors M. Gordon, J.C. Lowe
Professorial Lecturers S. Baum, E. Marasciulo
Associate Professors E.O. Pederson *(Chairman)*, A.K. Fitzsimmons
Assistant Professorial Lecturers D.E. Starsinic, J.F. Long, S.E.S. Mastra
J. Fehrenbach, C.L. Weber

Bachelor of Arts with a major in geography (departmental)—The follow
requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Required courses in the major—Geog 1 or 2 and 3; 30 semester hours
second-group geography and regional science courses, including Geog 105
be chosen in consultation with the undergraduate advisor.

Minor in geography—Required: one course from each of the following groups: cultural, population, and political geography: Geog 127, 145, 146; economic geography: Geog 2, 125, 141; physical geography: Geog 107, 108; resource management: Geog 132, 134, 135; urban geography: Geog 140, 142, 143.

Master of Arts in the field of geography—Prerequisite: a Bachelor of Arts degree with a major in geography from this University, or an equivalent degree. Required: the general requirements, pages 91–99. The minimum requirement consists of 30 semester hours of approved course work including a thesis; with the approval of the department, a student may elect a program of study without a thesis, but must then complete 36 hours of approved course work. A Master's Comprehensive Examination is required. Candidates must fulfill the tool requirement in one of three ways: (1) passing a reading knowledge examination in an approved foreign language; (2) satisfactorily completing six semester hours in statistics selected from Stat 105, 117, 118, 155, 159, 187, 188; or (3) satisfactorily completing Stat 106 and 110 (computer programming).

Master of Science and *Doctor of Philosophy in the field of geobiology*, see page 323.

Bachelor of Arts in Education and Human Development with a teaching field in geography—Prerequisite: the education curriculum, pages 114–15. Required: the geography option and the professional courses listed on page 119.

Master of Arts in Education and Human Development with a field in elementary or secondary education (specializing in geography)—Prerequisite: a bachelor's degree with sufficient concentration in geography to permit successful pursuit of graduate study in the Department of Geography and Regional Science. Candidates must be accepted by both the School of Education and Human Development and the Department of Geography and Regional Science. Required: the general requirements, pages 128–30, including 15 semester hours of graduate courses in geography and regional science.

First Group

1 Introduction to Geography (3) Staff
General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts. (Fall and spring)

2 Introduction to Economic Geography (3) Pederson
Examination of the basic principles which determine the location of economic activities. (Spring)

3 Introduction to Physical Geography (3) Staff
A study of the earth's physical environment, its systems, subsystems, and physical processes. Laboratory fee, $20. (Fall)

***91 East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

*An interdepartmental course offered by the Geography and Regional Science, East Asian Languages and Literatures, Economics, History, Philosophy, Political Science, and Religion departments.

Second Group

104 **Special Techniques in Cartography** (3) Fehrenbach
Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, $20. (Spring)

105 **Scope and Methods of Geography** (3) Pederson
Nature of geographical inquiry, approaches to the study of geography, empirical research methods. Admission by permission of instructor. (Fall)

106 **Introduction to Remote Sensing** (3) Fehrenbach
Examination of the principles and applications of remote sensing techniques using aerial photography and satellite imagery. Laboratory fee, $20. (Fall)

107 **Meteorology** (3) Staff
Atmospheric dynamics, systems, and controls. Laboratory fee, $20.

108 **Climatology** (3) Staff
Dynamic elements of climate; generic classification and distribution of climates. Laboratory fee, $20. (Fall)

110 **Geography of Desertification** (3) Staff
Man, climate, and change in arid regions.

115 **Field Program in Mesoamerican Archaeology and History** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico. (Summer)

124 **Urban Transportation** (3) Lowe
The relationship between freight and passenger transportation systems and urban land use patterns and structure. (Spring)

125 **Transportation Geography** (3) Lowe
The structure and evolution of transportation and communication networks and their impact on both inter-regional flows and regional development. (Fall)

127 **Population and Settlement** (3) Gordon
Patterns of world population; factors contributing to population pressures, growth, and migrations. (Spring)

132 **Resource Management and Conservation** (3) Fitzsimmons
Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies. (Fall)

133 **Food and Regional Development** (3) Gordon
Spatial aspects of food production and agricultural development. (Fall)

134 **Geography of Energy Resources** (3) Fitzsimmons
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations.

135 **Resources and Environmental Quality** (3) Fitzsimmons
Investigations into questions of resource use and environmental quality. Emphasis on public policy and societal attitudes as they influence man's use of resources. (Spring)

136 **Geography of Water Resources** (3) Staff
Investigation of the hydrologic cycle, focusing on precipitation, infiltration, and surface runoff. Laboratory fee, $20. (Spring)

137 **Environmental Hazards** (3) Staff
Man's response to various types of environmental hazards. (Spring)

140 **Urban Geography** (3) Pederson
Analysis of the internal spatial structure of cities; emphasis on explaining patterns of location within the city. (Fall)

141 **Urban Settlement** (3) Pederson
The location of cities, urbanization processes, theories and models of urban location and development.

142 **Urban Environments** (3) Lowe
The city viewed from a systemic perspective, focusing on the structure of service delivery systems and problems of spatial equity, and on the nature of urban climatology and hydrology. (Spring)

143 **Social Geography** (3) Lowe
A psycho-social perspective on human spatial behavior in the city, focusing on spatial perception, movement, activity-time budgets, and residential space.

145 **Cultural Geography** (3) Fitzsimmons
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations.

146 **Political Geography** (3) Pederson
Interrelationships among the human and physical environment and political systems; the organization of political territories. (Spring)

151 **Geography of U.S. and Canada** (3) Fitzsimmons
An examination of the social, environmental, and economic factors which have led to development of the several regions of the U.S. and Canada. (Spring)

154 **Geography of the Middle East** (3) Gordon
Cultural and physical regional patterns of the Middle East. (Fall)

161 **Geography of Latin America** (3) Gordon
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. (Fall)

189–90 **Readings in Geography** (arr.) Staff
(Academic year)

198 **Topics** (3) Staff
A consideration of geographic aspects of topical and future problems of society. Topics change each year. May be repeated for credit.

199 **Practicum** (3) Staff
Field work, internship or other controlled assignment with an agency or organization engaged in work in applied geography.

Third Group

219 **Seminar: Climatology** (3) Staff
Theories and models of climatic variations and systems.

220 **Climates of the Past and Climatic Modification** (3) Staff
Climatic history; examination of natural and induced climatic change. (Spring)

222 **Seminar: Resources and the Environment** (3) Fitzsimmons
Analysis of the spatial variations and interrelationships of resources and the environment.

223 **Seminar: The Population-Food Balance** (3) Gordon
Spatial problems associated with the dynamics and interaction of population growth and agricultural output. (Spring)

224 **Seminar: Political Geography** (3) Pederson
Examination of the political factor in location theory and analysis of the nature of political territories.

225 **Seminar: Transportation Geography** (3) Lowe
Analysis of human spatial interaction; emphasis on networks, graph theory, gravity, interaction and potential models, migration models and diffusion processes.

230 **Seminar: Spatial Implications of Resource and Environmental Policy** (3) Fitzsimmons
A consideration of the differential regional implications of and responses to resource and environmental policy decisions owing to regional differences in societal and physical parameters. (Fall)

243 **Seminar: Urban Geography** (3) Lowe
Functional processes affecting the evolving morphology and internal spatial patterns of urban phenomena; emphasis on economic factors, behavioral considerations, and impact of time. (Fall)

244 **Seminar: Urban Systems** (3) Pederson
Central place theory and other theories of urban location and the organization of systems of cities. (Spring)

250 **Regional Development** (3) Gordon
Geographic perspectives on the policy, planning, and programmatic aspects of regional development.

261 **Seminar: Geography of Latin America** (3) Marasciulo
Selected topics related to population, environment, and land use in Latin America. (Fall)

265 **Seminar: Geography of the Soviet Union** (3) Weber
Survey of USSR regions and major topical themes of Soviet geography, including population, energy, agriculture, transportation, and regional development. (Spring)

266 **Seminar: Geographic Perspectives on Contemporary China** (3) Staff

China's development prospects: environmental constraints, population growth, and regional differences in context of Chinese cultural patterns and political organization. (Fall)

287 **Seminar: Problems in Latin American Civilization** (3) Staff

Same as Anth/Econ/Hist/Rom 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Baum

Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) Long

Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Research** (arr.) Staff

May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

GEOLOGY

Professors G. Teleki *(Emeritus)*, G.V. Carroll, F.R. Siegel *(Chairman)*, A.G. Coates, R.C. Lindholm, J.F. Lewis
Adjunct Professors J.W. Pierce, I.G. Sohn, M.A. Buzas
Professorial Lecturers N. Hotton, D. Appleman, I. Zietz, W. Back, J.T. Hack
Associate Professorial Lecturers W.E. Maloney, A. Geiger, M.D. Turner
Assistant Professor G.C. Stephens
Assistant Professorial Lecturers F.J. Collier, C.C. Smith
Lecturer R.T. Rye

Bachelor of Arts or Bachelor of Science with a major in geology (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.
2. Required introductory course—Geol 21–22.
3. Required courses in related areas (a) Chem 11–12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11 or Phys 1 or 3 (for the degree Bachelor of Arts); BiSc 11, and Phys 1 or 3 (for the degree Bachelor of Science).
4. Required courses in the major—Geol 111, 112, 117, 118, 122, 123, 151–52 for both the degree of Bachelor of Arts and Bachelor of Science; Geol 128, 166, 189, 195 for the Bachelor of Science degree only.

Bachelor of Science with a major in geology—engineering option (engineering geology) (departmental)—An interdisciplinary curriculum offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science. (Students wishing to work toward the degree of Bachelor of Science [Civil Engineering] with a geology option [geotechnical engineering] should consult the *School of Engineering and Applied Science Bulletin.)* The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Required introductory courses—ApSc 57, 58; Chem 13; EE 51; Geol 21–22; Math 31, 32, 33; Phys 14, 15, 16; or equivalents.
3. Required courses in the major: CE 120, 140, 166, 167, 168, 182, 185; Geol 111–12, 117, 118, 122, 175, 189, 195, and one course chosen from Geol 128, 141, or 163; Math 111, 112; ME 126, 131; Stat 91 or 102 or ApSc 115.

Minor in geology—18 semester hours selected with approval of the departmental advisor to undergraduates, including 6 hours of introductory geology (Geol 1–2; 5 and 105; 21–22); two courses selected from Geol 111, 122, 151; and two from Geol 110, 125, 128, 154, or from requirements of the B.A. and B.S. (For students with special interdisciplinary interests, substitutions can be arranged.)

Master of Science in the field of geology—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, or an equivalent degree, and the Graduate Record Examination.

Required: the general requirements, pages 91–99. Master of Sciences degree candidates must include in their program of study Geol 141, 163, 205, and 272. Geol 299–300 *Thesis Research* is required. Candidates must pass a Master's Comprehensive Examination before submitting their thesis work. A reading knowledge examination in French, Spanish, German, or Russian must be passed before beginning the fourth semester of graduate work; other languages may be taken with permission of the department. With the permission of the department, candidates in the Master of Science program may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Arts in the field of geology—a 33-hour non-thesis option. Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. Master of Arts degree candidates must take Geol 128, 141, 163, 175, 189, 205, 219, 266, 272, and 295; two electives must be taken from Geol 216 or 263, 220 or 224, 241 or 243, and 253 or 255. Candidates must pass a Master's Comprehensive Examination. A reading knowledge examination in French, German, or Russian must be passed; other languages may be taken with permission of the department. With permission of the department, candidates may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Geology and Chemistry)—Prerequisite: a Bachelor's degree with a major in geology or in chemistry from this University, or an equivalent degree.

Required: the general requirements, pages 91–99, including Chem 111–12; Geol 141, 241 or 243, 249; Chem 213; and Geol 299–300. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Departments of Geology or Chemistry, must be passed prior to beginning the fourth semester of graduate work.

Master of Science in the field of engineering geology—An interdisciplinary degree offered by the Geology Department and the Civil, Mechanical, and En-

vironmental Engineering Department in the School of Engineering and Applied Science.

Prerequisite: A Bachelor of Science degree in geology or a Bachelor of Science (Civil Engineering) degree from this University or an equivalent degree which must include those courses or their equivalents as outlined for the undergraduate requirements in the field of geology with the engineering option (engineering geology). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis. (Students wishing to work toward a Master of Science in the field of geotechnics and foundation engineering should consult the *School of Engineering and Applied Science Bulletin*). Each program is arranged to fit the students' needs and interests. Either hydrogeology or engineering geology may be chosen as the field of specialization.

Required: (a) The general requirements, pages 91–99; (b) geology—at least 12 semester hours to include Geol 128, 141, 163, and 205; (c) engineering and physical science—at least 12 semester hours, which may include up to 9 semester hours of approved undergraduate civil engineering courses (12 for non-thesis candidates), the remainder to be selected from ApSc 211, 213; CE 204, 205, 206, 207, 208, 209, 214, 216, 219, 255, 256, 257, 265, 271; ME 221, 227, 231, 261, 262; EngS 212, 213, 214, 218, 221, 228, 230, 231, 233, 236. The tool subject requirement is the same as for the Master of Science in the field of geology above.

Master of Science and *Doctor of Philosophy in the field of geobiology*, see page 323.

Doctor of Philosophy in the field of geology—Required: the general requirements, pages 91–93, 99–101, including passing a reading knowledge examination in an approved foreign language and one other approved tool subject; and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

Research fields: geomorphology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy, structural geology, geochemistry, geophysics, and hydrogeology.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Geology and Chemistry Departments)—Required: the general requirements, pages 91–94, 99–101, including passing a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

Bachelor of Arts in Education and Human Development with a teaching field in earth science—Prerequisite: the education curriculum, pages 114–15. Required: the earth science option and the professional courses listed on page 118.

First Group

1–2 **Introductory Geology for Nonscience Majors** (3–3) Staff

An introduction, for nonscience majors, to the principle features of the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, continental drift, origin of life, and evolution. Lecture (2 hours), laboratory (2 hours). Laboratory fee, $16 per semester. (Academic year)

5 **Environmental Geology** (3) Siegel, Lindholm

The relation of people and society to natural environments; popula-

tion evolution and mineral resources; economic, legal, and political aspects. Laboratory fee, $15. (Fall and spring)

21–22 **Physical and Evolutionary Geology** (3–3) Lindholm, Lewis
Lecture and laboratory (5 hours). Principles of geology as a base for further study in geology and related sciences. Laboratory fee, $15 per semester. Admission by permission of instructor. (Academic year)

Second Group

101 **History of Geological Sciences** (3) Teleki
Development of scientific thought; history of geological and related sciences. (Spring)

105 **Geological Hazards in Land-Use Planning** (3) Siegel
An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 5 or 21, or permission of instructor. Laboratory fee, $10. (Spring)

110 **Mineralogy and Petrology for Environmental Sciences, Oceanography, and Fields Allied to Geology** (3) Carroll
Lecture and laboratory. Prerequisite: permission of instructor. Laboratory fee, $10. (Spring)

111 **Mineralogy** (4) Carroll
Lecture and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1 or 21. Laboratory fee, $15. (Spring)

112 **Crystal Optics** (4) Carroll
Lecture and laboratory. Optical phenomena of crystals and uses of the polarizing microscope. Prerequisite: Geol 111. Laboratory fee, $18. (Fall)

113 **Crystallography** (3) Appleman
Point-group and space-group theory, fundamentals of crystal structure, x-ray diffraction theory and application. Prerequisite: Math 31. Laboratory fee, $15. (Alternate academic years)

117 **Petrology** (2) Lewis
Introduction to silicate phase systems; physics and chemistry of crustal and magmatic processes; volcanic processes and products. Prerequisite: Geol 21, 111–12; Phys 1 or equivalent; or permission of instructor. (Spring)

118 **Petrology Laboratory** (2) Lewis
Concurrent registration in Geol 117 required for geology majors. Prerequisite: Geol 111. Laboratory fee, $18. (Spring)

122 **Structural Geology** (3) Stephens
Interpretation of geologic formations on basis of their structures. Prerequisite: Geol 22. (Fall)

123 **Structural Geology Laboratory** (1) Stephens
Solution of geometrical problems of structural geology. Prerequisite or concurrent registration: Geol 122. Laboratory fee, $10. (Fall)

125 **Marine Geology** (3) Pierce
Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and

marine environment. Prerequisite: Geol 1–2 or 21–22; or permission of instructor. (Spring)

128 **Geomorphology** (3) Stephens

Lecture (2 hours), laboratory as arranged. Nature and evolution of earth forms; principles of photointerpretation. Prerequisite: Geol 21. Laboratory fee, $10. (Spring)

132 **Economic Geology** (3) Turner

Genesis and distribution of mineral raw materials and their uses. Prerequisite: Geol 111. (Fall)

136 **Engineering Geology** (3) Geiger

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31; Phys 2 or 4; or permission of instructor. Laboratory fee, $10. (Spring)

141 **Introductory Geochemistry** (3) Siegel

Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisites or concurrent registration: Geol 117 or equivalent; Chem 11–12; Math 30; Phys 1 or 3; or permission of instructor. Laboratory fee, $5. (Fall)

151–52 **Invertebrate Paleontology** (3–3) Coates

Biology, taxonomy, functional morphology, and evolutionary patterns of the invertebrate fossil groups, with emphasis on the macroinvertebrates. Prerequisite: Geol 1–2 or 21–22; or permission of instructor. Laboratory fee, $15 per semester. (Academic year)

154 **Vertebrate Paleontology** (3) Hotton

Lecture (2 hours), laboratory or field work as arranged. General features of vertebrate morphology and evolution; problems of paleoecology and adaptation. (Fall, odd years)

158 **Micropaleontology** (3) Staff

Biology, morphology, paleoecology, biogeography, and biostratigraphy of marine and non-marine phosphatic, organic, siliceous, and calcareous microfossils. (Fall, even years)

163 **Sedimentation** (4) Lindholm

Lecture (2 hours), laboratory (4 hours), field trips as arranged. Principles of sedimentation, analysis and interpretation of sedimentary processes and environment, laboratory experiments in the properties of sedimentary particles. Prerequisite: Geol 111, 112; Stat 91; or permission of instructor. Laboratory fee, $15. (Fall)

166 **Principles of Stratigraphy** (3) Coates

Fundamentals of stratigraphic principles and practice. Review of historical concepts, section measuring, vertical and lateral lithostratigraphic relationships, magnetic and climatic stratigraphy, biostratigraphic classification, zonation, correlation, geochronology, facies, and stratigraphic maps. Prerequisite: Geol 151–52 or permission of instructor. (Fall)

175 **Hydrogeology** (3) Back

The occurrence, storage, movement, quality, and problems of pollution of subsurface water, and the hydrologic properties of water-

bearing materials. Prerequisite: Geology 111, 122; Math 31; Chem 11–12; or permission of instructor. (Spring)

181 **General Oceanography** (3) Maloney
Chemical and physical properties of sea water, movements of water masses, meteorological interrelations, ecology of marine plants and animals. Prerequisite: Math 31 or equivalent, or permission of instructor. (Spring, odd years)

189 **Geophysics for Geologists** (3) Stephens
Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 21–22; Math 31; Phys 1 or 3; or permission of instructor. (Fall)

195 **Field Work** (2) Staff
Weekend field trips. Surveying, geological mapping, and specific field work methods. (Spring)

199 **Undergraduate Research or Reading** (arr.) Staff
Problems approved by the staff. May be repeated once for credit. (Fall and spring)

Third Group

205 **Seminar in Geology** (1) Staff
Special topics each semester. May be repeated for credit.

216 **Sedimentary Petrography** (3) Lindholm
Identification, classification, and interpretation of common sedimentary rocks by means of the petrographic microscope. Prerequisite: Geol 111, 112, 163; or permission of instructor. Laboratory fee, $15. (Spring)

219 **Petrogenesis I** (3) Lewis
The origin of selected igneous and metamorphic rock types. Laboratory fee, $15. (Fall)

220 **Petrogenesis II** (3) Lewis
Laboratory fee, $15. (Spring)

224 **Advanced Structural Geology** (3) Lewis
Rock deformation. Methods of study and the formation of structurally complex rock. Tectonics. Prerequisite: Geol 122 or permission of instructor. (Fall, odd years)

241 **Marine Geochemistry** (3) Siegel
Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Geol 141, Math 31, and permission of instructor. Recommended: Chem 22. Laboratory fee, $15. (Spring, even years)

243 **Geochemical Prospecting** (3) Siegel
Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Prerequisite: Geol 141. Laboratory fee, $15. (Spring, odd years)

249 **Seminar: Geochemistry** (2) Siegel
Independent topics each semester; may be repeated for credit.

253 **Applied Paleontology** (3) Coates and Staff
(Formerly Paleoecology, Biogeography, and Paleoclimatology)
Fundamentals of paleoecology using case histories from a wide variety of fossil invertebrate and vertebrate groups. Includes functional morphology of the individual organism, analysis of paleopopulations, paleocommunities and paleobiogeographic provinces and realms. Relationship of faunal and floral paleobiogeographic units to plate tectonics and uses of different fossil groups in tectonics, paleoclimatology, paleobathymetry, paleochronology, and related topics will be discussed. (Fall, odd years)

254 **Evolutionary Paleobiology** (3) Staff
Consideration of modern evolutionary theory with emphasis on the fossil record. (Spring, odd years)

255 **Quantitative Paleoecology** (3) Buzas
Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life-death, size-frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of community biofacies. Prerequisite: Geol 151–52, Stat 91; or permission of instructor. (Fall, odd years)

258 **Seminar: Micropaleontology** (3) Staff
Prerequisite: Geol 158 or permission of instructor. May be repeated for credit. (Fall, even years)

263 **Sedimentary Environments** (3) Lindholm
Study of selected depositional environments. Field trips as arranged. Prerequisite: Geol 163; Stat 91. (Fall, even years)

266 **Advanced Stratigraphy** (3) Coates and Staff
Analysis of special topics in stratigraphy. Historical background, concept of facies, cycles of sedimentation, clastic and carbonate subsurface lithofacies, subsurface biostratigraphy, ecological and evolutionary attributes of stratigraphically useful organisms, quantitative methods, isochronology, geochronology, and magnetic-stratigraphy. (Spring, even years)

272 **Regional Geology** (2) Carroll

295 **Research** (arr.) Staff
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

GERMANIC LANGUAGES AND LITERATURES

Professors J.C. King, K. Thoenelt, C. Steiner *(Chairman)*
Associate Professorial Lecturer P. Werres
Assistant Professorial Lecturer E.M. Pulgram
Lecturer L. Melbourne

Bachelor of Arts with a major in Germanic languages and literatures (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Ger 1–2, 3–4, 9–10, 51–52; or equivalent.
3. Required courses in other areas—six semester hours of history, and six semester hours in one of the following subjects: art history, music history, or philosophy.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179–80; reasonable proficiency in speaking, reading, and writing German.

Minor in German—Required: 12 semester hours of second-group courses, including Ger 179–80 and one two-semester course in German literature taught in German. Prerequisite: Ger 1–4, 9–10, 51–52, or equivalent.

Bachelor of Arts in Education and Human Development with a teaching field in German—Prerequisite: the education curriculum, pages 114–15.
Required: the German option and the professional courses listed on page 119.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

GERMAN

First Group

1–2 **First-year German** (3–3) Staff
Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 2: Ger 1. (Fall and spring)

*3–4 **Second-year German** (3–3) Staff
Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and simple composition. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 3: Ger 1–2 or equivalent. Prerequisite to Ger 4: Ger 3. (Fall and spring)

*9–10 **German Conversation and Composition** (3–3) Steiner
(Academic year)

* With permission of instructor, Ger 9 or 10 may be taken concurrently with Ger 4.

47 **Beginning German for Reading Acquisition** (3) Staff
For undergraduates and graduate students with little or no German who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall)

49 **German Readings for Nonmajor Students** (3) Staff
Primarily for graduate students preparing for reading examinations, undergraduates admitted. No academic credit for graduate students. Prerequisite: Ger 4 or 47, or equivalent. (Spring)

51–52 **Introduction to German Literature—in English** (3–3) Staff
Lecture, recitation, and discussion. Selected readings in German literature from the earliest periods to the present. (Academic year)

Second Group

103–4 **Major Themes of German Literature—in English** (3–3) Thoenelt
Lecture and discussion. Ger 103—the *Faust* theme in German thought and civilization, from Goethe to Thomas Mann; Ger 104—the anti-Faust movement in German thought and civilization. Central topics: Jean Jacques Rousseau's return to nature and progress; *Realpolitik* and the arts and letters; *Kultur* (self-realization), the *Bildungsroman* and technocracy. (Alternate academic years)

111–12 **Comparative Studies in Germanic Literatures—in English** (3–3) Thoenelt
Lecture and discussion. Topics for 1981-82: Ger 111—Absurdity and rebellion, loss and rediscovery of the self, changing Gestalt concepts, from Existentialism back to Enlightenment, selected works of Thomas Mann, Böll, Frisch, Hesse, Strindberg, Goethe and others. Ger 112—Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. From Plato to the 20th century. Selected works and excerpts from Plato, Aristotle, Horace, Shakespeare, Montaigne, Goethe, Schiller, Heine, Nietzsche, Thomas Mann, Sartre, Camus, Böll and others. (Alternate academic years)

126 **France and Germany—in English** (3) Thoenelt
Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. (Summer)

131–32 **18th-Century German Literature—in German** (3–3) Thoenelt
Enlightenment, Storm and Stress, Classicism. Reading, lecture, and discussion. Central topic: *Geist und Tat*—or the 18th-century concept of literature's formative function in society. (Alternate academic years)

141–42 **19th-Century German Literature—in German** (3–3) Steiner
Romanticism, Biedermeier, young Germany, poetic realism. Second age of chivalry and *Sehnsucht*, revolution and counter-revolution in thought and literature. Birth and growth of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture and discussion. (Alternate academic years)

151–52 **20th-Century German Literature—in German** (3–3) Steiner
The age of Nietzsche, Naturalism, Impressionism, Expressionism;

Kafka, Thomas Mann, Hesse; émigré literature, contemporary drama; authors of Gruppe 47. Reading, lecture, and discussion. (Alternate academic years)

161 **Directed Readings in German Literature I** (3) King
Texts selected from medieval literature, humanism, reformation, and baroque. Offered as the demand requires.

162 **Directed Readings in German Literature II** (3) Steiner
Readings of representative writers of modern German prose. Offered as the demand requires.

179–80 **Advanced German Conversation and Composition** (3–3) Thoenelt
Discussions and compositions on literary and cultural topics, readings of newspaper articles, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammar and style studies. (Alternate academic years)

Third Group

201–2 **Middle High German** (3–3) King

211–12 **History of the German Language** (3–3) King

213–14 **Old Norse** (3–3) Allee

271–72 **Seminar: German Realism** (3–3) Steiner
Analysis of authors, work, genres, and literary trends. Topic for 1981-82: *Kritik und Aufbruch*. Investigation of German sociocritical literature from Lessing to Peter Handke.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

SANSKRIT

105–6 **First-year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 106. Language, literature, and culture of ancient India. Essentials of grammar; reading of classical texts. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Alternate academic years)

107–8 **Second-year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 108. Language, literature, and culture of ancient India. Continuation and review of grammar; reading of more difficult classical and Vedic texts. Aural-oral practice in language laboratory. Prerequisite: Ger 105–6 or equivalent. Laboratory fee, $17.50 per semester. (Alternate academic years)

GERONTOLOGY—GRADUATE PROGRAM

Professors R.G. Brown *(Academic Director)*, R.A. Kenney
Professorial Lecturer M. Sicker
Associate Professor R.M. Scheffler
Associate Professorial Lecturer M.H. Morrison

Committee on Gerontology

W.G. Boren, R.G. Brown *(Academic Director)*, J.C. Heddesheimer, R.A. Kenney, R.M. Scheffler

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in Special Studies with a concentration in gerontology, directed by the Committee on Gerontology and drawing upon faculty from various departments within the University and resource persons in the community.

The Gerontology Program derives its theoretical perspectives and substantive knowledge from several disciplines to provide a balanced study of the processes of aging, and societal reactions and responses to the aged and their problems, with the objective of preparing persons for positions which involve the planning, development, and evaluation of programs serving older persons. Each student will work closely with an advisor to design a program of studies appropriate to individual interests and professional objectives. Every student will have field experience in an agency involved in the planning and evaluation of services for the elderly. Prospective candidates should consult with the director of the Gerontology Program.

Master of Arts in Special Studies with a concentration in gerontology—Prerequisite: a bachelor's degree with a *B* average (or equivalent) from an accredited college or university. In some cases, the applicant may be requested to take the Graduate Record Examination. Previous experience in gerontology is not essential; a variety of academic and experiential backgrounds are acceptable.

Required: the general requirements, pages 91–99, including 36 semester hours of course work. There is no thesis requirement. At least 18 hours must be taken in arts and sciences departments. Gern 201, 205, 290; Soc 280, 254; Educ 344; and HSA 290 are core courses required for all students. The remaining five courses must be taken in no more than two fields. In addition, the program involves a tool requirement, which may be satisfied by obtaining the grade of *B* or better in Stat 53 or by passing a waiver examination. The tool requirement must be fulfilled before the final two core courses are undertaken. All students are required to pass a Master's Comprehensive Examination.

201 **The Biology of Aging** (3) Kenney

The processes of aging in the various systems of the human body; principal illness patterns in the elderly; theories of the aging process. (Spring)

205 **Public Policy and Aging** (3) Scheffler, Sicker

The "political economy" of aging in our society. Political and governmental processes as they influence and are influenced by older persons; the impact of demographic trends and retirement patterns on the economic system. (Fall)

290 **Practicum in Gerontology** (3) Morrison

Field experience in an agency involved in the planning and evaluation of services for the elderly.

GREEK

See **Classics.**

HEALTH SERVICES ADMINISTRATION

Professors L. Gintzig, M.C. Devolites, K.J. Darr, P.N. Reeves *(Chairman)*, P.S. Birnbaum
Professorial Lecturers H.L. Hirsh, C.C. Rorrie, H.R. Wertlieb
Associate Professors R.G. Shouldice, R.F. Southby
Associate Professorial Lecturers C.V. Gordon, N.B. Hadley, A. Liberman, A.J. Singh
Assistant Professors D.F. Bergwall, S.D. Lind, G.E. Crum, C.P. McKelvey, M.E. Hatcher *(Visiting)*, W.D. Greaf *(Research)*, D.J. Moon *(Research)*
Assistant Professorial Lecturers M.G. Bromley, M.M. Barch, D.P. Andrulis, S.B. Cohen, M.E. Samuels, D.F. Eversmann, P.L. Knight
Lecturers J.E. Clair, R.E. Koran

Programs of study leading to the degrees of Master of Health Services Administration* and Post-masters Graduate Certificate in Health Services Administration, and areas of concentration in health services administration in programs leading to the degrees of Doctor of Business Administration and Doctor of Public Administration, are offered by the School of Government and Business Administration (see pages 135–64).

142 **Financial Management in Health Care Institutions** (3) Eversmann
Consideration of the nature, analysis and interpretation of accounting data. Cost accounting, budgeting and internal control techniques, emphasis on their use in the management planning and control process. (Spring)

153 **Survey of Health Care Organization** (3) Clair
Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall)

154 **Introduction to Hospital Management and Procedures** (3) Clair
Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and on the functions of the department manager. Prerequisite: HSA 153 or consent of instructor. (Spring)

170 **Quantitative Methods in Health Care Administration** (3) Gordon
Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than upon manipulating predeveloped formulas. (Fall)

190 **Special Topics in Health Care Administration** (3)
Experimental offering at the undergraduate level. (Fall and spring)

Third Group

202 **Introduction to Health and Medical Care** (3) McKelvey, Crum, Samuels
Lecture and discussion (2 hours), laboratory (2 hours). Examination

* Accredited by the Accrediting Commission on Education for Health Services Administration.

of the nature of health and disease using biomedical, epidemiological, and ecological models. Description and analysis of resource, process, and control components involved in delivering services—technology, manpower, patients, delivery mechanisms, and assessment and allocative mechanisms. Survey of selected disease problems and their impact on management and planning. Medical terminology. (Fall and spring)

203 **Organization and Management of Health Services** (3) Shouldice, Hadley, Gintzig

Application of management theory and concepts to health services systems and institutions. Characteristics, functions, and organizational structures of delivery systems. (Fall and spring)

207 **Program Evaluation in Health Services** (3) Lind, Liberman

Basic investigatory techniques used to conduct, as well as to assess and interpret, evaluation of health services programs. Includes information systems and data collection, analyses, and reporting. Introduction to computer applications. (Fall and spring)

208 **Quantitative Methods in Health Services Operations** (3) Hatcher, Cohen

Concepts and application of quantitative methods in health services operations, involving biostatistics, demand analysis and forecasting, resource allocation, and quality and productivity control. (Fall and spring)

209 **Health Resources Management I** (3) Devolites, Birnbaum, Koran

Introduction to health resource management and funds administration for health services institutions and agencies. Preparation of budgets, financial statements, and reports. Financial analysis. Management of plant and equipment. Regulation and containment of costs. Safeguarding assets. (Fall and spring)

210 **Health Resources Management II** (3) Southby, Hatcher

Study of health manpower, development, allocation, and utilization. National health expenditures. Review of micro- and macroeconomic principles as they apply to health services programs. (Fall and spring)

212 **Introduction to Health Planning** (3) Hatcher, Rorrie, Crum

Introduction to the history and development of government health planning programs in the United States. Basic health planning methods and procedures useful at a project or institutional level. The generic planning process; mechanisms for plan implementation. (Fall and spring)

215 **Health Services and the Law** (3) Hirsh

The sources of law and the legal processes affecting the health services system. Elements of administrative law and agency processes. Introduction to the legal relationships, e.g., torts, contracts, and insurance, of facilities, physicians, personnel, and patients. Legal aspects of labor relations, and trends in health services delivery law. (Fall and spring)

221 **Health Systems Planning** (3) Reeves, Singh

Application of advanced quantitative and rational methodologies for

planning health systems. Discussion focuses on a selected sequence of critical components in the health planning process. Prerequisite: HSA 208 and 212 or permission of instructor. (Fall)

223 **Seminar: Policy in Health Planning** (3) Crum

Effects of legal, political, social, and economic factors in health planning, with emphasis on local policy formulation, analysis, and implementation. The role of local health policy as an expression of community values. Prerequisite: HSA 212 or permission of instructor. (Spring)

225 **Developing National Health Services Policy** (3) Darr

Understanding and analyzing the processes by which health services policy is formulated and implemented at the federal level. Focus on Congress, the presidency, and the agencies. (Fall)

227 **Seminar: Ethics in Health Services Administration** (3) Darr, Crum

Investigating moral and ethical problems confronting the health services system. Understanding the legal, social, and policy implications of issues in medical and health services delivery such as: administrative and institutional ethics, professional codes, impaired professionals, death, fertility control, experimentation and new technology, and resource allocation. (Spring)

231 **Managing the Short-Term Hospital** (3) Darr, Barch

Lecture and discussion (2 hours), laboratory (2 hours). Organization, management, and interrelationships of hospital clinical, support, and administrative departments. Analyses of procedures and systems. Hospital personnel administration. Administrative ethics. Requirements of the Joint Commission on Accreditation of Hospitals. Prerequisite: HSA 203 and Mgt 207, or permission of instructor. (Fall and spring)

233 **Delivery of Mental Health Services** (3) Andrulis

Study of the organizations and systems for delivery of mental health services; emphasis on management and financing treatment and rehabilitation facilities. (Fall and spring)

235 **Human Services Integration** (3) Reeves

Introduction to the concept of a human services system. Description and analysis of current human services programs as components of such a system and of the roles of the public and private sectors in providing these services. Discussion of interorganizational theory as a basis for understanding current system configurations and for developing improved service delivery systems. (Spring)

236 **Introduction to Long-Term Care Administration** (3) Lind, Wertlieb

Evolution of long-term care as a health care delivery subsystem. Comparative evaluation of characteristics of various types of institutions and programs. Government regulation. Relationships between the purposes and functions of these institutions and programs and the health care needs of the community are investigated. (Fall)

237 **Managing the Long-Term Institution** (3) Wertlieb

Organization and management of nursing homes, personal and residential care facilities, and institutions for other populations needing long-term specialty treatment. Emphasis on personal and profes-

sional skills necessary to provide a wide range of services and quality care in these environments. (Fall and spring)

238 **Ambulatory Health Services Management** (3) Shouldice

Introduction to the organization and management of ambulatory care. Presentation of models, financing mechanisms, institutional affiliations, estimating and planning for ambulatory care, and the use of solo and group practice of medicine as part of a total system of services delivery. (Fall)

239 **Management of Health Maintenance Organizations** (3) Shouldice

Basic principles and fundamentals of prepaid group practice and health maintenance organizations. Emphasis on planning, development, and operation of HMOs, including discussion of models, financial issues, consumers, and providers of care. (Spring)

245 **Case Studies in Health Services Administration** (3) Devolites, Birnbaum, Southby

Discussion (2 hours), laboratory (2 hours). Intensive qualitative and quantitative analyses of major problem areas in health system management and planning using the case study method. Cases cover the broad spectrum of health policy, planning, and operations of the health services system. Serves as a capstone course for health services management students. (Fall and spring)

252 **Comparative Health Services Systems** (3) Gintzig

Evaluations of various organizational patterns, functions, and trends in international health services delivery systems. Emphasis on sources of such differences and significance of the systems to the health status of a nation. Primarily for advanced students, open to others by arrangement. (Spring)

255 **Issues in Gerontology** (3) Lind

Interdisciplinary seminar on the nature and problems of aging, including social, psychological, biological, economic, demographic, health, and service needs of the older population. Introduces theory and research, and explores attitudinal and behavioral components based on contact with older persons. Discussion of reactions to aging. (Fall)

257 **Advanced Health Resources Management** (3) Bromley

Study of health manpower, development, allocation, and utilization. National health expenditures. Review of micro- and macroeconomic principles as they apply to health services programs. (Fall)

270 **Research in Health Services Administration** (3) Reeves

Field research. Primarily for advanced students; open to others with consent of instructor. May be repeated for credit. (Fall and spring)

271 **Field Problem Studies in Health Services Administration** (3) Crum

Work experience guided by a qualified preceptor on selected management and planning issues and problems occurring in health services facilities, programs, and agencies. Primarily for advanced master's and doctoral students; open to other students by arrangement. May be repeated for credit. (Fall and spring)

273–74–75 **Residency I** (3–3–3) Staff
Twelve-month residency. Work experience guided by a qualified preceptor; periodic written progress reports and a written major report or selected field projects are required. (Fall and spring)

276–77–78 **Residency II** (3–3–3) Staff
For students who take additional residency experience. (Fall or spring)

285–86 **Readings in Health Services Administration** (3–3) Reeves and Staff
Supervised readings in special areas of health services management and in policy and planning. Primarily for advanced students; open to others by arrangement. May be repeated for credit. (Fall and spring)

290 **Special Topics in Health Services Administration** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated for credit. (Fall or spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to the other graduate students at the discretion of the Department.

310 **Health Resources Allocation Policies** (3) Southby
Study of major contemporary issues in health resources allocations. Development and critique of policies designed to deal with these issues. (Fall)

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

330 **Health Services Delivery Policy** (3) Lind
Study of major contemporary issues in health services delivery. Development and critique of policies designed to deal with those issues. (Spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral students preparing for the general examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

HEBREW

See **Classics.**

HISTORY

Professors R.H. Davison, R.B. Thompson, R.C. Haskett, R.P. Sharkey, H.M. Sachar, R.W. Kenny, P.P. Hill, L.G. DePauw, R. Thornton, L.G. Schwoerer *(Chairman)*, P.F. Klarén
Adjunct Professor R.P. Multhauf
Professorial Lecturers S. Shaloff, A.B. Davis, H.J. Viola
Associate Professors C.J. Herber, W.R. Johnson, R.A. Hadley, A.D. Andrews, R.E. Kennedy, Jr., J.O. Horton, L.P. Ribuffo, W.H. Becker *(Visiting)*
Adjunct Associate Professors L.J. Lear, A.L.K. Nelson
Assistant Professor M.A. Atkin

Bachelor of Arts with a major in history (field-of-study or departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Required introductory courses—Hist 39–40, 71–72, or equivalent. Majors may waive one or more of the prerequisite courses by passing departmental examinations, by attaining scores of 600 or above on the College Entrance Examination Board Achievement Tests, or by good performance on Advanced Placement Examinations. Credit for one or more of the prerequisite courses may be received by superior performance on departmental or Advanced Placement Tests. The Department does not accord either waiver or credit by CLEP examination.

3. Required courses in related areas—(a) either 12 semester hours of an approved foreign language or (b) nine semester hours in statistics (Stat 53, 105, and 97).

4. (a) *Field-of-study major*—Hist 199 (Proseminar), six semester hours of third-group courses, including at least three semester hours of research seminar, and the passing of the major examination in the senior year. In planning a program, the student, under the guidance of an advisor, should choose courses which will provide a broad understanding of diverse chronological and geographical aspects of the human experience.

(b) *Departmental major*—27 or more hours of second- and third-group courses, including Hist 199, six semester hours of third-group courses, including at least one research seminar, and six semester hours chosen from each of the following fields: I (Europe)—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 125, 127, 131, 132, 136, 139, 140, 141, 142, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 198; II (United States)—Hist 128, 129, 133, 134, 137, 167, 169, 170, 171, 172, 173, 174, 175, 176, 177, 179, 180, 181, 182, 183, 184, 185, 186, 197, 198; III (Russia, Asia, Africa and Latin America)—Hist 102, 107, 108, 116, 119, 135, 143, 145, 146, 158, 161, 162, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196.

A pamphlet relating to the major is available in the offices of the dean of the Columbian College of Arts and Sciences and in the History Department.

An Honors Program may be chosen by juniors with satisfactory scholastic records. Application to this program must be made before the beginning of the second semester of the junior year. Students accepted into the program take a three-hour seminar in the second semester of the junior year and complete the research requirements for the history major by preparing the Senior Honors Thesis (Hist 191–92) in the final year of undergraduate study.

Minor in history—Undergraduate students who select a minor in history must ordinarily declare their intention to the departmental advisor no later than the

beginning of their senior year. Such students may choose a non-specialized history curriculum, or may concentrate in one area such as ancient history, medieval history, early modern Europe, modern Europe, the Near East, Russia and East Europe, the United States, Latin America, or the Far East, or in one field such as economic, social, intellectual, diplomatic, political, black, or women's history. In each case the program of courses will be planned in consultation with the history advisor. To meet the departmental requirements for a minor, the student must complete at least 15 semester hours in approved courses with a grade of *C* or above. One 3-semester-hour seminar must be included in the program.

Master of Arts in the field of history—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination with the Advanced Test in History and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 91–99. The program of study consists of (1) a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300 *Thesis Research*, or (2) a minimum of 36 semester hours of second- and third-group courses, including at least two research seminars (six semester hours). Hist 201 is required of candidates who have not previously had a course in historiography and historical method. At least six semester hours of each candidate's program must be in third- or fourth-group history courses; a maximum of six may be in approved courses outside the History Department. To receive graduate credit for second-group courses, master's candidates must arrange for extra work with the instructors. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

Master of Arts in the field of history with a concentration in historic preservation—Required: the general requirements, pages 91–99. This 36-hour master's degree program combines courses in United States history and historic preservation. It includes at least 18 hours of U.S. social history, U.S. urban history, man-made America, and the seminar sequence in historic preservation. For other course distribution requirements, see the departmental graduate advisor. Candidates in this program may satisfy the tool requirement by passing an examination in measured architectural drawing.

Doctor of Philosophy in the field of history—Required: the general requirements, pages 91–94, 99–101, including the passing of a written examination in two appropriate foreign languages, or one foreign language and an approved tool subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. The major fields include the following: ancient history, medieval Europe, early modern Europe, modern Europe, United States, Latin America, modern Near East, modern Far East, Russia and East Europe. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, historic preservation, etc.) to the chronologically limited fields (e.g., American colonial history, Tudor and Stuart England, etc.). A student may elect one special field outside of the History Department if it is relevant to the program. Students having a special field in historic preservation may satisfy one tool requirement by passing an examination in measured architectural drawing.

Bachelor of Arts in Education and Human Development with a teaching field in history—Prerequisite: the education curriculum, pages 114–15.

Required: the history option and the professional courses on page 119.

Course Accessibility: All second-group courses are open to students without history course prerequisites with the exception of Hist 157 and 199.

First Group

39–40 European Civilization in Its World Context (3–3) **Staff**

Hist 39: Introduction to the political, social, economic, religious, and cultural history of Europe from about 800 A.D. to 1715. Hist 40: from 1715 to the present. (Academic year)

41 Roots of the Western Tradition (3) **Staff**

Same as Clas/Engl/Phil/Rel 41. Basic ideas of Western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spirtual autobiography. To be taken only in conjunction with Engl 13. (Spring)

71–72 Introduction to American History (3–3) **Staff**

Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present. (Academic year)

***91 East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101–2 History of Revolution (3–3) **Thompson**

Hist 101: revolution as a theme in world history from ancient times to Luther, Cromwell, and Robespierre. Hist 102: revolution and the revolutionary movement in the age of Marx, Lenin, and Mao. (Academic year)

103–4 American Intellectual History (3–3) **Cunliffe**

Same as AmCv/Univ 103–4. Ideas, their exponents and their influence, relating to government and politics, religion, culture, personal and group behavior, and other topics. Hist 103: from Jamestown to the Civil War. Hist 104: since the Civil War. (Academic year)

105–6 History of Science (3–3) **Multhauf**

Hist 105: from ancient natural philosophy through the 17th-century scientific revolution. Hist 106: from the Industrial Revolution to the 20th-century amalgamation of science and technology. (Academic year)

107 The Ancient Near East and Egypt to 322 B.C. (3) **Hadley**

Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.

* An interdepartmental course offered by the History, East Asian Languages and Literatures, Economics, Geography and Regional Science, Philosophy, Political Science, and Religion Departments.

108 **Greece and the Near East, 359 B.C. to the Second Century A.D.** (3) Hadley

Survey of cultural, social, political, and economic developments in the Hellenistic world and societies of the Near East from the reign of Philip II to the height of Roman power and influence in these regions.

109 **Early Aegean and Greek Civilizations to 338 B.C.** (3) Hadley

Neolithic background: Bronze age—Minoan, Helladic, and Mycenaean civilizations; classical Greek civilization to the Macedonian conquest. (Fall)

110 **The Roman World to 337 A.D.** (3) Hadley

Prehistoric Italy; rise and decline of the Roman Empire and Latin civilization; cultural, social, and political developments in the Greek world under Roman rule. (Spring)

111–12 **Medieval History** (3–3) Andrews

Hist. 111: Failure of the old Roman Empire, formation of barbarian kingdoms in the West and their evolution to about 1000 A.D.; Byzantium and Islam at their apogee. Hist. 112: Medieval European daily life, institutions, and creative movements to about 1400; the Crusades and the Near East to the rise of the Ottoman Turks. (Academic year)

116 **History of Africa** (3) Shaloff

Survey of political, cultural, and economic development from ancient times to the present. (Spring)

117 **Crisis or Conspiracy? A History of the International Politics of Oil** (3) Becker

The history of the international politics of oil, with special attention to developing relationships between major oil companies and governments here and abroad. (Summer)

118 **Business and American Life** (3) Becker

The historical interaction of business with other American institutions: religion, the family, law, education, government, labor unions, etc. (Summer)

119 **China in the 20th Century: Reform and Revolution** (3) Johnson

Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)

121 **The Renaissance in Western Europe** (3) Schwoerer

Study of the economic, political, intellectual, and cultural acceleration in Western Europe, beginning in the Italian city-states and spreading to France, Germany, and England, in the 14th through 16th centuries. (Fall)

122 **The Reformation in Western Europe** (3) Herber

Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)

123 **European Intellectual History I** (3) Kennedy

Popular culture; religion and science in the 17th century; the Enlightenment; Voltaire, Hume, Rousseau, Montesquieu, Beccaria, Did-

erot, Condorcet on religion, history, nature, society, and politics; the intellectural origins of the French Revolution. (Fall, even years)

124 **European Intellectual History II** (3) Kennedy

Intellectual responses to the French Revolution; 19th-century historical approaches to society, religion, economics, biology, ethics, and psycholanalysis: Hegel, Comte, Marx, Darwin, Nietzsche, and Freud; the intellectual origins of Nazism; literary, artistic, and philosophical responses to World War I. (Spring, odd years)

125 **Women in European History** (3) Schwoerer

A study of the role of women in the political, social, intellectual, and economic life of Europe from the Middle Ages to the 20th century. (Spring)

127 **Theories of History** (3) Lavine

Joint offering of the History and Philosophy Departments. Major philosophies of history: Judeo-Christian, idea of progress, historicism, Hegelian-Marxist dialectic, cyclical (Vico, Spengler, Toynbee), and social-scientific (Kant, Weber) views. Contemporary problems of historical knowledge. (Fall)

128–29 **War and Society** (3–3) McDonald

How wars, armed forces, and defense policies have affected British and American politics and society. Special attention to the relationship of defense and foreign policy, civil-military relations, the development of strategic thought, and to the naval and military influence Britain and America have exerted on each other. Hist 128: from 1776 to 1918. Hist 129: 1919 to the present. (Academic year)

131–32 **History of Germany** (3–3) Herber

Political, social, and cultural development. Hist 131: from mid-17th century to Bismarck. Hist 132: from William II to the present. (Academic year)

133 **Recent U.S. History, 1890-1941** (3) Ribuffo

Political, social, diplomatic, and intellectual developments, with particular emphasis on the "searching" 20's and New Deal. (Fall)

134 **Contemporary U.S. History Since 1941** (3) Ribuffo

Political, social, diplomatic, and intellectual developments, with particular emphasis on the Cold War, "silent" 50's, and disrupted 60's. (Spring)

135 **History of Soviet Intelligence Services** (3) Dziak

The role and impact of intelligence and security operations in Soviet domestic and foreign policy, 1917 to the present. The course examines the literature and problems of Soviet intelligence operations; Tsarist antecedents; Lenin, the Cheka, and the formative years; operations under Stalin; problems of the post-Stalin years; and operations in the Brezhnev era.

136 **Europe in the 20th Century** (3) Sachar

Diplomatic, political, and cultural developments from the turn of the century to the present. (Summer)

137 **U.S.-Soviet Strategic Relations Since World War II** (3) Thornton

Survey of U.S.-Soviet global rivalry from World War II to the present; comparative historical assessment of the changing strategic balance. (Spring)

139–40 **World History in the 20th Century** (3–3) Sachar

Diplomatic, political, and cultural factors. Hist 139: from the turn of the century to the Munich settlement of 1938. Hist 140: from the Munich settlement to the present. (Academic year)

141 **History of France I** (3) Kennedy

Old Regime: Louis XIV, demography, peasants, bourgeois, nobles; Church-Protestant-Jewish relations; salons, Enlightenment and *philosophes;* literacy and education; Robespierre and Revolution; Napoleon. (Fall, odd years)

142 **History of France II** (3) Kennedy

The Revolutionary tradition, and authoritarianism from the Restoration to De Gaulle; the events of 1848, socialism and the class struggle; women, marriage, morals, and population; industrialization and rural France; dechristianization, Catholic integralism and worker priests; France's decline as a world power; its intellectual and artistic leadership. (Spring, even years)

145 **Russia to 1801** (3) Atkin

Survey of Russian history from the rise of the Kievan confederation in the ninth century to the establishment of Imperial Russia as a European great power. Attention will be given to the political, socio-economic, and cultural history of the East Slavs, especially the Russians. (Fall)

146 **Russia and the Soviet Union from 1801 to the Contemporary Era** (3) Atkin

Survey of Russian and Soviet history from the reign of Alexander I to the post-Stalin era. Attention will be given to the contending forces of revolution, reform, and conservatism; diplomatic relations; economic development; social change; and Russian culture. (Spring)

147 **Economic History of Modern Europe** (3) Sharkey

Joint offering of the History and Economics Departments. Economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

148 **The French Revolution** (3) Kennedy

Social, political, economic, and cultural history of the decade of revolution, 1789–1799. Attention to its structural consequences in France and in Europe-at-large. (Summer)

149–50 **European Diplomatic History** (3–3) Davison

Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)

151–52 **History of England** (3–3) **Kenny**
Development of English civilization and its impact on Western culture. Hist 151: to 1689. Hist 152: since 1689. (Academic year)

153 **Tudor England** (3) **Kenny**
Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485-1603. (Fall)

154 **Stuart England** (3) **Schwoerer**
Grand Rebellion, Restoration, and Glorious Revolution. The political, religious, socioeconomic, and intellectual developments in England, 1603–1714. (Spring)

155 **History of Modern Ireland** (3) **Kenny**
The political and cultural development of Ireland since the Middle Ages and the continuing interaction between Ireland and England, with emphasis on the period from the Act of Union of 1801 to the Partition of 1923.

156 **Winston Churchill as War Leader** (3) **McDonald**
Churchill's role—from cavalry subaltern to prime minister—in the British Empire's wars during his lifetime, with special attention to the two world wars.

157 **20th-Century European Diplomatic History** (3) **Sachar**
The main currents, with necessary 19th-century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)

158 **Modern Jewish History** (3) **Sachar**
A secular history of the Jewish people from the 18th century to the present state of Israel; emphasis on European political, economic, and cultural influences. (Spring)

161 **Revolution in 20th-Century Latin America** (3) **Klarén**
Examination of the major social revolutions in modern Latin America, especially in Mexico (1910), Bolivia (1952), Cuba (1959), and Chile (1970); their origins, social composition, leadership, and ideology. (Spring, even years)

162 **20th-Century Latin America** (3) **Klarén**
A survey of the main societal trends shaping Latin America in this century, with particular emphasis on such themes as populism, urbanization, reformism, modernization, Peronism, nationalism, Communism, Castroism, the military, and the development process. (Spring)

163–64 **History of Latin America** (3–3) **Klarén**
Hist 163: Analysis of Spanish and Portuguese imperialism in the New World, 1492-1820. Hist 164: a problems approach to Latin America, 1820 to the present; thematic emphasis on neo-colonialism, corporatism, liberalism, *caudillismo*, modernization, populism, and revolution. (Academic year)

165 **Latin America and the Industrializing World, 1850–present** (3) **Klarén**
Examination of the political/diplomatic responses of Latin American

nations, individually and collectively, to the expanding industrial powers of the Northern hemisphere in the 19th and 20th centuries. (Fall)

166 **History of Mexico** (3) Klarén

Focus on Aztec imperialism, the Indian view of the Conquest, landlord/peasant relations, the struggle for independence, the Revolution of 1910; race, caste and class in modern Mexico; the role of the modern Mexican state. (Fall, odd years)

167 **Man-Made America: The Old Colonial Scene** (3) Haskett

An interpretive tour through the early American landscape, 1607–1750. Heavily illustrated with color slides. (Fall)

168 **Man-Made America: Views of a New Nation** (3) Haskett

An interpretive tour through the early American landscape. 1750–1820. Heavily illustrated with color slides. (Spring)

169 **The American Revolution** (3) DePauw

The political, intellectual, social, military, and economic impact of the events surrounding the separation of the United States from the British Empire. Special attention to the influence of non-elite groups. (Spring)

170 **U.S. Early National History** (3) Hill

Political, diplomatic, economic, and social history of the early republic, 1789–1828. (Fall)

171–72 **U.S. Social History** (3–3) Horton

Hist 171: daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607–1861. Hist 172: the urban-industrial era from 1861 to present.

173 **Afro-American History** (3) Horton

Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as AmCv 173. (Fall)

174 **Special Topics in Afro-American History** (3) Horton

Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as AmCv 174. (Spring)

175–76 **U.S. Political History** (3–3) Haskett

A study of power: who gets what, where, when, and how. Hist. 175, 1763–1865; Hist. 176, 1865–1960. (Academic year)

177 **The Ante-bellum South** (3) DePauw

Investigation of political, economic, intellectual, social, and cultural characteristics of the American South prior to 1860. Special attention to myths associated with the South, ideologies supporting the slave system, and cultural practices among the white, black, and Indian populations. (Fall, alternate years)

179–80 **U.S. Economic History** (3–3) Sharkey

Joint offering of the History and Economics Departments. Economic growth from colonial times to the present. Development of various

sectors in the economy and their interdependence. Hist 179: 1607–1865. Hist 180: from 1865 to the present. (Academic year)

181–82 **U.S. Diplomatic History** (3–3) Hill

American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century. (Academic year)

184 **Civil War and Reconstruction** (3) Horton

How the Union and Confederacy organized for war, evolved strategies, and searched for commanders who could win battles and how the war affected ordinary soldiers and citizens. Political, economic, and social consequences of the Civil War. (Spring)

185 **History of Women in America** (3) DePauw

Joint offering of the History Department and the American Studies Program. Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. (Fall)

186 **U.S. Urban History** (3) Gillette

The American city from colonial foundations to the present, relating social and economic forces to physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, focusing on implications for public policy and historic preservation. Same as AmCv 186. (Fall)

187 **History of Modern China** (3) Johnson

China since 1840, particular attention to political developments. (Fall)

188 **History of Chinese Communism** (3) Thornton

Survey of the leadership, ideology, structure, and foreign and domestic policies of the Chinese Communist Party from its inception to the present. (Fall)

189 **History of Modern Japan** (3) Sigur

Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)

190 **Ethnohistory** (3) Wagner, Humphrey

Joint offering of the Anthropology and History Departments. Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*.

191–92 **Senior Honors Thesis** (3–3) Herber

Required of and open only to undergraduate honors candidates in history. (Academic year)

193 **History of the Near East** (3) Davison

Byzantine, Arab, Persian, and Islamic backgrounds; rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, even years)

194 **History of the Modern Near East** (3) Davison, Sachar
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states; impact of the West on culture and institutions; great-power imperialism; crises of Turkish Straits, Suez, Arab-Israeli relations; and other issues. (Fall, odd years)

195 **Traditional Civilizations of China and Japan** (3) Johnson
Intellectual, institutional, and social development of the traditional civilizations of China and Japan from their origins to 1800. (Fall)

196 **The Modern Transformation of China and Japan** (3) Johnson
The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present. (Spring)

197 **Oral History and Interview Techniques** (3) Staff
Joint offering of the History Department and the American Studies Program. Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area.

198 **Special Topics in History** (3) Staff
Historical perspectives on great issues of past and present. New topic

199 **Proseminar: Readings for the History Major** (3) Staff
Required of senior history majors. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)
each semester.

Third Group

Any student who has had the appropriate preparation may, with the consent of the instructor, enroll in a third-group course. History majors will satisfy the third-group requirement by taking either two courses designated "Research," or one course designated "Research" and one course designated "Readings/Research" in which they may opt for a readings program.

201 **History and Historians** (3) Staff
Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Spring)

203–4 **Research Seminar** (3–3) Staff
Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year)

205 **Readings Seminar: Evolution of Nationalism in Eastern Europe** (3) Petrov
Formation of national consciousness and emergence of modern East European states after World War I. Developments of the interwar period. Open to qualified undergraduate seniors. (Fall)

206 **Readings Seminar: Revolution in Eastern Europe** (3) Petrov
Transformations of East European states during World War II. Resistance movements, communization, and national self-assertion to

the immediate post-Stalin period. Open to qualified undergraduate seniors. (Spring)

209 **Readings/Research Seminar: Topics in Ancient History** (3) Hadley

Readings on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit.

211 **Readings/Research Seminar: Medieval History** (3) Andrews

Prerequisite: Hist 111–12 or equivalent. Students with working knowledge of Latin may receive research credit. Focus on a particular area and period, with emphasis on interdisciplinary research techniques.

213–14 **History in Public Policy-Making** (3–3) Nelson

(Formerly Issues in Documentary Editing and Internship in Documentary Editing)

Seminar in the use of historical insights and methods in policy-making, with emphasis on domestic issues. Assessment and use of primary sources for policy analysis and the use of historical analogy in policy formulation.

215 **Readings Seminar: Communist Monolith That Never Was** (3) Petrov

(Formerly Transformation of the Socialist Community)

Soviet relations with East European and Asian socialist states from the end of World War II to the Sino-Soviet split. Changes in substance and form in relations among ruling Communist parties. Open to qualified undergraduate seniors. (Spring and summer)

217 **Readings/Research Seminar: Russian and Soviet Thought** (3) Atkin

Selected topics in the intellectual, social, and cultural history of 19th- and 20th-century Russia and Soviet Union.

220 **American Business History** (3) Becker

A readings or research seminar devoted to the historical development of American business institutions in manufacturing, distribution, transportation, and finance. These business institutions will also be considered in the context of America's legal system, governmental organization, and social institutions. (Fall)

221 **Comparative Business History** (3) Becker

A readings or research seminar on the history of business institutions in manufacturing, distribution, transportation and finance in England, Germany, France, and Japan. The course will be primarily devoted to the period since industrialization, studying business institutions in their economic, legal, governmental, and social contexts. (Spring)

224 **Readings/Research Seminar: European Intellectual History** (3) Kennedy

Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural life.

225 **History of Washington, D.C.** (3) Gillette

Joint offering of the History Department and the American Studies Program. The social history of Washington, from village to metropolis, with emphasis on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Field trips.

228–29 **Readings/Research Seminar: Modern Military and Naval History** (3–3) McDonald

Discussion, readings, and research in 20th-century British and American military and naval history. Special attention to World War I (Hist 228) and World War II (Hist 229). Topics include Anglo-American coalition warfare, and the interaction of strategy, diplomacy, and national policy in both war and peace.

230–31 **Readings/Research Seminar: Strategy and Policy** (3–3) McDonald

Hist 230: A study of the historical development of strategy, and the relationship of military thought to national policy. Hist 231: 20th-century strategic thought. (Academic year)

232 **Comparative Communist Systems I** (3) Wolchik

Joint offering of the History and Political Science Departments. A readings seminar on comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. (Fall)

233 **Comparative Communist Systems II** (3) Wolchik

Joint offering of the History and Political Science Departments. A readings seminar on comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba, and non-ruling communist parties. (Spring)

234 **Modern Archives Administration** (3) Barrese*

Open to history graduate students and undergraduate majors. Lectures and discussion on all phases of administering archival materials. Classes at National Archives. Students must enroll before September 1 for October session, before April 1 for June session.

237 **Readings Seminar: Soviet Foreign Policy, 1917-1964** (3) Petrov

Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful co-existence" and detente. Open to qualified undergraduate seniors. (Fall and summer)

239 **Readings/Research Seminar: Early Modern European History** (3) Schwoerer

Research or discussion seminar. Topics selected from Western European history of the 14th through 17th centuries. Readings or research depending upon students' interests and curricular needs.

241 **Readings/Research Seminar: Modern European History** (3) Herbert

Prerequisite: appropriate preparation and consent of instructor.

245 **Readings Seminar: Studies in Macrohistory** (3) Thompson

Six major systems in the philosophy of history: Plato, Augustine, Hegel, Marx, Spengler, Toynbee.

* Edward Barrese is Director of the Modern Archives Institute.

246 **Readings/Research Seminar: History of Modern Russia and Soviet Union** (3) Atkin

Selected topics in the domestic history of modern Russia and Soviet Union. Readings or research depending upon students' interests and curricular needs. (Fall)

247 **Readings/Research Seminar: The Theory and Practice of Modern Imperialism** (3) Sharkey

Critical analysis of Marxist and non-Marxist theories of modern imperialism in the light of late 19th and 20th century European and American experiences in Asia, Africa, and Latin America. (Fall)

248 **Readings Seminar: Modern European and Near Eastern History** (3) Davison

Admission by permission of instructor. (Spring)

249 **Research Seminar: European Diplomatic History** (3) Davison

Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great powers and their statesmen in the 19th or 20th centuries. Reading knowledge of one language other than English required. (Fall)

251 **Readings/Research Seminar: English People and Institutions** (3) Kenny, Schwoerer

Selected topics in the political, social, intellectual, and economic history of England. Focus upon one time period and special area of interest.

253 **Readings Seminar: History of Sino-Soviet Relations** (3) Thornton

Readings in the history and historiography of Sino-Soviet relations since 1949.

254 **Research Seminar: History of Sino-Soviet Relations** (3) Thornton

Development of analytical and scholarly skills in the study of selected topics. Focus on the preparation of a scholarly paper.

255–56 **U.S.-Soviet Strategic Relations Since World War II** (3–3) Thornton

Seminar designed to develop a conceptual framework for understanding contemporary U.S.-Soviet relations. Readings the first semester; research the second. (Academic year)

258 **Communist Party of the Soviet Union** (3) Sodaro

Joint offering of the History and Political Science Departments. Analysis of the internal evolution of the Communist Party of the Soviet Union and its role in the Soviet system from its origins to the present day.

261 **Readings Seminar: Topics in 20th-Century Latin America** (3) Klarén

Admission by permission of the instructor. (Fall)

262 **Research Seminar: Agrarian Society and Economic Change in Modern Latin America** (3) Klarén

Research on the impact of modernity (e.g., foreign capital, immigration, internal migrations, capitalism, imperialism) on traditional rural society. Admission by permission of instructor. (Spring)

271–72 **U.S. Social History** (3–3) Horton
Hist 271: Readings seminar on American daily life, institutions, and intellectual and artistic achievements. Hist 272: Research seminar.

274 **Research Seminar: Materials in Afro-American Culture** (3) Horton
Joint offering of the History Department and the American Studies Program. Prerequisite: Hist 173 and 174 or equivalent. (Fall and spring)

275–76 **Readings/Research Seminar: U.S. Political and Colonial History** (3–3) Haskett
Research or readings, depending on students' interest and curricular needs. Topics on various aspects of the colonial period or political aspects of various periods. Admission by permission of instructor. (Academic year)

277–78 **Historic Preservation** (3–3) Pearce
Joint offering of the History and Urban and Regional Planning Departments and the American Studies Program. The preservation movement and its literature. Review of current experience, preservation practice, and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. Admission restricted to master's degree candidates in historic preservation program. (Academic year)

279 **Readings/Research Seminar: American History** (3) Hill
Readings or research, depending on students' interests and curricular needs. Admission by permission of instructor. (Summer)

281–82 **Readings/Research Seminar: U.S. Diplomatic History** (3–3) Hill
Research or readings, depending on students' interest and curricular needs. Hist 281 covers the period 1776-1890; Hist 282, the period 1890-1950. (Academic year)

283–84 **Readings/Research Seminar: Recent U.S. History** (3–3) Ribuffo
Prerequisite: six semester hours of 100-level American history courses. Research or readings depending on students' interests and curricular needs.

285 **Research Seminar: Women in the United States** (3) DePauw
Prerequisite: Hist 185 or equivalent. Practical examination of research, writing, and publication problems in the preparation of scholarly articles for feminist and historical journals. (Spring—alternate years)

286 **Research Seminar: Early American History** (3) DePauw
Practical skills associated with the production and marketing of historical writing. Each student will write a feature article on an aspect of early American history and edit the work of other members of the class. (Spring—alternate years)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Same as Anth/Econ/Geog/Rom 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

288 **Research Seminar: History of Chinese Communism** (3) Thornton
Research seminar on selected topics related to China. Emphasis is on developing research methods, concepts, and the preparation of a scholarly paper. (Spring)

289 **Readings/Research Seminar: Modern Japanese History** (3) Sigur
Selected topics in modern Japanese history from the Meiji Restoration of 1868 to the present. Research or readings depending on students' interests and curricular needs. (Spring)

291 **Readings/Research Seminar: 20th-Century History** (3) Sachar
Research or readings on selected topics. (Fall)

292 **Israel, Zionism, and the Arab World** (3) Sachar
Research seminar. (Spring)

293 **Research Seminar: Modern East Asian History** (3) Johnson

294 **Research Seminar: The Modern Near East** (3) Davison
Readings, discussion, and research in selected political, economic, social, cultural, and international developments in the 19th and 20th centuries concerning countries from the Balkans, through Turkey and the Arab countries, to Iran. (Spring)

295–96 **Readings Seminar: Modern East Asian History** (3–3) Johnson

297 **Special Topics Seminar** (3) Staff
Open to doctoral and master's candidates and qualified undergraduates. May be repeated for credit. Offered whenever five or more students can be enrolled.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Prerequisite to all fourth-group history courses: consent of instructor.
Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.
The University is a member of the Folger Institute of Renaissance and 18th-century Studies. The policies of the Institute are set by a central committee on which each member institution is represented. Doctoral students enrolled in the Institute seminar are eligible to apply for fellowship aid. Students wishing to register for the course should consult the chairman of the History Department.

301 **Folger Institute Seminar** (3) Staff
Topics will be announced. May be repeated for credit provided the topic differs.

342 **Readings in Modern European History** (3) Davison
From the French Revolution to the period following World War I. (Spring)

379–80 **Readings in Economic History** (3–3) Sharkey
Joint offering of the History and Economics Departments. Hist 379: American economic history. Hist 380: modern European economic history. (Academic year)

398 **Advanced Readings and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

HUMAN KINETICS AND LEISURE STUDIES

Professors L.M. Stallings, J.L. Breen *(Chairman)*, D. Hawkins, J.E. Snodgrass, D.C. Paup
Professorial Lecturers E.L. Shafer, R. Anzola-Betancourt, C.A. Troester, Jr., T. Songster, R.O. Keelor
Associate Professors L.H. George, M.R. Withers, A.L. Dickerson *(Research)*
Associate Professorial Lecturers D.L. Edgell, W.M. Kane, D.M. Brody
Assistant Professors H. Nashman, N.D. Johnson
Assistant Professorial Lecturers S.Y. Cha, P.G. Davidoff, D.C. Frechtling, T.J. Riegert, J.V. Ackerman
Instructors D.C. Park *(Research)*, A. Morris *(Research)*
Lecturers M.M.H. Ramsay, E.A. Burkhardt, J.J. Goldblatt, W.C. DeMull, L.E. McDevitt, C.D. Cox, M. Elbin, S. Endler, S.A. Kriegsman, W. Woodson, L. Wilkinson, E. Price, S. Levy, A. Lang

Programs of study leading to the degrees of *Bachelor of Science in Human Kinetics and Leisure Studies* (opportunity for specialization in elementary and secondary school physical education, dance education, or dance as a performing art) and *Master of Arts in Education and Human Development* (with specialization in adaptive physical education, dance, perceptual-motor development, general physical education, therapeutic recreation, or tourism development and travel administration) are offered by the School of Education and Human Development (see pages 104–35).

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

First Group

With the exception of students pursuing undergraduate degrees in the School of Education and Human Development, credit for HKLS activities courses is not recognized for the baccalaureate degree.

Students whose medical examinations indicate the desirability for remedial or restricted activity are assigned to programs especially adapted to their needs. Unless otherwise indicated, all first-group courses are offered both in the fall and spring semesters.

All first-group courses may be repeated with permission of the instructor.

10 **Beginning Badminton** (1) Breen

13 **Beginning Ballet Technique** (1) Staff

14 **Beginning/Intermediate Ballet Technique** (1) Staff

17 **Beginning Modern Dance Technique** (1) Staff

18 **Beginning/Intermediate Modern Dance Technique** (1) Staff

19 **Dance** (1)

20 Beginning/Intermediate Golf (1) Staff

21 Foil Fencing (1) Staff

22 Basketball (1) Staff

24 Volleyball (1) Staff

26 Tae Kwon Do (Korean) (1) Staff

27 Beginning Tennis (1) Staff

28 Intermediate Tae Kwon Do (Korean) (1) Staff

29 Yoga (1) Staff

30 Body Conditioning (1) Staff

31 Roller Skating (1) Staff

32 Beginning Swimming (1) Staff

33 Swimming/Life Saving (1) Staff

34 Intermediate Swimming (1) Staff

36 Springboard Diving (1) Staff

37 Soccer (1) Staff

38 Racketball (1) Staff

39 Handball (1) Staff

40 Squash (1) Staff

41 Team Handball (1) Staff

42 Aerobic Dance (1) Staff

51 Gymnastics (2) Staff
Emphasis on apparatus and trampoline.

52 Modern Dance Technique I (2) Staff
(Formerly 1 credit)

53 Modern Dance Technique II (2 or 3) Staff
May be repeated for credit.

54 Intermediate/Advanced Tennis (2) Staff
Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.

55 Swimming—Water Safety for Instructors (2) Staff

56 Scuba Diving (2) Staff
Laboratory fee, $50.

57 Intermediate/Advanced Badminton (2) Breen
(Spring)

58 Intermediate Ballet Technique (2 or 3) Staff
May be repeated for credit.

59 **Team Sports** (2)
(Fall)

60 **Racket Sports** (2)
(Spring)

61 **Aquatic Leadership** (2)
(Fall)

62 **Conditioning/Weight Training** (2)
(Spring)

63 **Games and Movement Activities for Children** (2)
(Spring)

64 **Horseback Riding** (2)
Laboratory fee, amount announced in *Schedule of Classes.*

65 **Skiing** (2)
Laboratory fee, amount announced in *Schedule of Classes.*

66 **Synchronized Swimming** (2)

68 **Sport Clinics** (2)
Special intensive study and skill development.

Second Group

101 **Physical Education and Sports in Human Resource Centers** (3)
Development of physical education and sports programs in schools and play settings. Includes philosophy and curriculum.

102 **Movement Education** (3)
Techniques of teaching movement education with emphasis on problem-solving methods for kindergarten and grades 1–6. (Fall)

103 **Professional Foundations and Concepts of Human Kinetics and Leisure Studies** (3)
Nature, scope, and scientific basis of human kinetics and leisure studies; orientation to professional competencies.

104 **Introduction to Travel and Tourism** (3)
Survey of the travel and tourism industry with emphasis on the travel agency, marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism. (Fall)

105 **Introduction to Therapeutic Recreation/ Adaptive Physical Education** (3)
Philosophy, methods, and concepts relating to adaptive physical education and therapeutic recreation. (Fall)

106 **Introduction to Dance Therapy** (3)
General survey of dance therapy areas from theoretical and experimental points of view. Exploration of professional opportunities and training. (Fall)

107 **Ethnic Dance** (2) Johnson
Methods and materials of European folk and social forms of dance. Laboratory experiences assigned. (Spring)

108 **Dance Improvisation** (3) Staff
Awareness of body movements, environment, group dynamics, performance and composition through improvisational technique. (Fall and spring)

109–10 **Dance Composition** (3–3) Withers
HKLS 109: basic elements and principles of composition. HKLS 110: advanced problems in composition. Prerequisite: HKLS 108 or equivalent. (Academic year)

111–12 **Sports Education Technique** (3–3) George
Techniques for teaching individual, dual, and team sports. (Academic year)

113–14 **Practicum** (3–3) Nashman
Pre-practice teaching or practical experience in elementary or secondary school physical education; adaptive physical education, dance, or tourism settings. Seminars relating to field experiences. (Academic year)

115 **Movement Technique for Theater** (2) Ramsay
Basic body awareness, sensory awareness, and movement exploration. Analysis of movement and dramatic justification of movement. May be repeated for credit. (Fall)

116 **Mime Movement and Theater** (2) Ramsay
Fundamentals of mime for the beginner. Isolation and illusion exercises. Work with masks, building improvisation and set pantomimes. May be repeated for credit. (Spring)

117 **Dance Education** (3) Johnson
Organizational, methodological, philosophical and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157. (Fall)

118 **Special Problems in Dance Composition** (1) Staff
Work with elements of movement leading to short composition studies. Prerequisite: HKLS 109–10 or equivalent. (Fall and spring)

119 **Creative Dance for Children** (3) Withers
Dance as an expressive art medium for children; concepts, principles, methods and materials. Emphasis given to dance in elementary education with consideration for special education. (Spring)

120 **Repertory** (1 or 2) Staff
Study and performance of dance works. Admission by permission of instructor. May be repeated for credit. (Fall and spring)

121 **Modern Dance Technique III** (2 or 3) Staff
Intermediate/advanced modern dance. Prerequisite: HKLS 53 or equivalent. May be repeated for credit. (Fall and spring)

122 **Methods and Materials for Health Education** (3) Kane
Conceptual approach to curriculum design and teaching, including

planning and organization, methodology, selection and use of materials and evaluation; basic health knowledge. (Fall and spring)

123 **Modern Dance Technique IV** (2 or 3) Withers
Advanced modern dance. Prerequisite: HKLS 121 or equivalent. May be repeated for credit. (Fall and spring)

129 **Introduction to Motor Learning** (3) Stallings
Concepts of motor skill learning applied to the teaching of movement skills. (Fall)

130 **Introduction to Motor Development** (3) Snodgrass
Study of the evolvement and refinement of fundamental movement skills. (Spring)

133 **Student Teaching** (6 to 12) Nashman
Prerequisite: HKLS 113–14 or equivalent. Admission by permission of instructor. (Fall and spring)

135–36 **Dance History** (3–3) Johnson
Study of dance from antiquity to present; emphasis on cultural significance of dance as art, education, and social behavior. (Academic year)

137 **Dance and Movement Analyses** (3) Staff
Concepts and elementary principles of movement analysis with emphasis on effort and shape. (Spring)

138 **Curriculum, Organization and Administration of Physical Education and Athletics** (3) George
Curriculum and administration related to physical education and athletic programs. Professional ethics. (Fall)

139 **Coaching Behavior** (3) Snodgrass
Study of behavioral patterns and interactions related to individual and team sports. (Spring)

141–42 **Theater Production for Dance** (3–3) Staff
Theory and practicum in technical aspects of dance production, lighting, sound, theater management, costuming, make-up, publicity, promotion, and audiovisual techniques. (Materials to be purchased.) (Academic year)

144 **Choreography** (3) Staff
Solo and group. May be repeated for credit. Prerequisite: HKLS 109-10 or equivalent; HKLS 141–42 recommended. (Fall and spring)

150 **Introduction to Human Anatomy** (3) Stallings
Systematic study of the structure of the human body. (Fall)

151 **Kinesiology** (3) Paup
Analysis of human movement, including mechanical physics, anatomy, and physiology. Prerequisite: an approved course in anatomy. (Spring)

156 **Application of Recreational Skills to Contemporary Lifestyles** (3) George
Development of recreational skills; emphasis on local opportunities for recreational activities. Current trends in community recreational

development and program planning. May be repeated for credit with permission of instructor. (Fall and spring)

157 **Dance Technique Theory** (3) Withers
Theoretical foundations of dance. Applied principles of kinesiology, analysis and practice of contemporary dance techniques. (Fall)

158 **Safety: Prevention, and Care of Sports Injuries** (3) George
Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.

164 **Physiology of Exercise** (3) Paup
The physiological functions of the body and the effect of exercise on these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)

171 **Current Professional Literature and Competencies** (3) Snodgrass
Study of current literature with implications for HKLS specializations; use of library resources and retrieval systems; evaluation of professional competencies. Prerequisite: HKLS 103.

172 **International Experiences** (1 to 6) Staff
Travel to a foreign country for study of a specific topic.

173 **Independent Study** (1 to 3) Staff
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit.

175 **Music for Dancers** (3) Staff
Rhythmic theory and analysis; resources in music and accompaniment principles for dance. Prerequisite: basic knowledge of rhythmic theory. (Spring, even years)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler
Same as Educ 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference, and related conference activities.

184 **Workshop** (1, 3, or 6) Staff
Titles announced in *Schedule of Classes*. May be repeated for credit with permission of advisor.

187 **Introduction to Sign Language and Deafness** (3) Staff
Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 187 and SpEd 187.

188 **Sign Language and Deafness** (3) Staff
A second course in conversational expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 188 and SpEd 188.

190 **Sales Management for Travel Agents** (3) Davidoff
An in-depth study of agency products and services, with methodologies for maximum control and efficiency. (Fall)

191 **Business Management for Travel Agents** (3) Davidoff
Basic principles of business administration applied to small businesses in general and to travel agencies in particular. General management concepts (planning, organizing, leading, and controlling), with specific applications in management areas, including personnel, finance, office operations, law, and insurance. (Spring)

192 **Marketing Management for Travel Agents** (3) Davidoff
Marketing theories as applied to the travel agency. Coverage of the marketing mix in travel, market segmentation, market planning, and the use of advertising and other communications techniques. Emphasis on increasing profitability through planned marketing programs. (Fall)

193 **Domestic and International Tourism** (3) Davidoff
An overview of tourism theory, with emphasis on how such knowledge can help the travel agent understand and improve his or her function. Emphasis on the psycho-social aspects of tourism on the traveller and host community. Economic and social impacts are discussed. (Spring)

Third Group

202 **Conceptual Basis of Motor Learning** (3) Stallings
Variables of perceptual motor learning and performance; theories, concepts, and models of learning related to the development of motor skills. (Fall and spring)

205 **Perceptual-Motor Programs: Diagnostic-Therapeutic Techniques** (3) Stallings
Programs of perceptual-motor therapy and their basic assumptions and diagnostic-therapeutic techniques. (Spring)

230 **Advanced Concepts in Motor Development** (3) Snodgrass
Study and practice in techniques of critical observance and analysis of motor behavior throughout the life span, with special emphasis on period from birth to age eight and on the aged. (Fall)

232 **Current Issues in Elementary School Physical Education** (3) Snodgrass
Current philosophy, trends, and research; implications for curriculum, instruction, evaluation. (Spring)

239 **Administration of Recreation and Tourism Services for Special Populations** (3) Hawkins
Development of recreation and tourism opportunities for disabled, elderly, and other special populations; emphasis on administrative competencies in community organization, communications, consultation, program development, evaluation, and fiscal management. (Spring)

240 **Physical Education for the Handicapped** (3) Songster
Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications. (Fall)

244 **Therapeutic Recreation Practice** (3) Morris
Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming, and relationship of therapeutic recreation to total rehabilitation goals. (Spring)

245 **Medical Aspects of Disabilities and Handicapping Conditions** (3) Songster
Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions: implications for programming and facility development as related to therapeutic recreation, adaptive physical education, and other therapies. (Fall)

249 **Tourism, Recreation, and the Quality of Life** (3) Hawkins
Impact of leisure on cultural development and social values; specific emphasis on psychosocial aspects of tourism and recreation. May be taken for undergraduate credit with permission of the instructor. (Fall)

250 **Administration of Travel and Tourism Services** (3) Staff
Organization and management concepts, theories, and issues, stressing application of theory through analysis of short case examples drawn from the broader range of the travel and tourism industry.

251 **Theories and Techniques of Leisure Lifestyle Planning** (3) Staff
Overview of theories and concepts of leisure counseling, leisure education, and total leisure lifestyle planning. Emphasis on methods and techniques of leisure assessments, attitudinal change, and facilitating leisure planning for special populations as well as the general public.

252 **Supervision in Therapeutic Recreation** (3) Staff
Roles and functions of supervision in therapeutic recreation and service. Didactic and experiential activities related to problem-solving in supervision. Emphasis on group dynamics and interpersonal communication skills in supervisory responsibilities.

256 **Sports Medicine** (3) Brody
Theory, practice, and research in diagnostic treatment, rehabilitation, and prevention of sports-related injuries.

260 **Tourism Development** (3) Riegert, Frechtling
Relationship of economic theory and principles to tourism development; applications of economic analysis techniques to the travel and tourism field. (Fall)

261 **Planning for Tourism** (3) Anzola-Betancourt
Integrated planning for travel and tourism organizations, financial and physical development for comprehensive tourism projects; consideration of basic concepts, approaches, and models. (Fall)

262 **Tourism Policy Analysis** (3) Edgell
Understanding components of tourism policy, development of tools for tourism policy analysis, and description of tourism organizations in the government and private sector. (Spring)

265 **Sports and Politics** (3) Breen
Methods of political analysis applied to sports policy; comparative approach to the study of the relationships between ideology, economic development, and the types and levels of government involvement in sports policy. (Spring)

270 **Philosophic Foundations of Dance** (3) Johnson
Examination and discussion of aesthetic theories in the arts and dance as a performing art, with application to criticism. (Spring)

271 **Dance Reconstruction** (1 to 3) Staff
Recreating the structure and dynamics of movement from dance scores. (Fall and spring)

273 **Advanced Choreography** (3) Staff
Group or solo choreography. Course work includes responsibility for auditions, rehearsals, and presentation in concert. May be repeated once for credit. Prerequisite: HKLS 144 or equivalent. (Fall or spring)

276 **Dance in Society** (3) Johnson
Anthropological aspects of dance; emphasis on current research and literature.

280 **Advanced Workshop** (1 to 3) Staff
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall and spring)

282 **International Experiences** (1 to 12) Staff
May be repeated for credit with approval of advisor.

283 **Practicum** (3 to 6) Staff
Field work, internship and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall and spring)

290 **Advanced Seminar** (1 to 3) Staff
May be repeated for credit with approval of advisor. (Fall and spring)

293 **Independent Study** (1 to 6) Staff
May be repeated for credit with approval of advisor.

296 **Systems Analysis of Tourism Services** (3) Shafer
Quantitative analysis, resource identification, design techniques, and other systems approaches applied to travel and tourism services. (Fall)

297 **Advanced Topical Studies** (3) Breen and Staff
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. (Fall and spring)

299 **Thesis Research** (6) Staff

Fifth Group Staff

701 **Experimental Course** (3)

721 **Experimental Course—Interdepartmental** (3)

INDIVIDUAL GRADUATE PROGRAMS

Committee on Individual Programs

W.B. Griffith *(Chairman and Program Director)*, B. Catron, J. Cordes, R. French, T. Hufford, P. Lengermann, C. Rice

The Graduate School of Arts and Sciences offers the course listed below primarily for students with individualized interdisciplinary programs of study for the Master's degrees in Special Studies. The Committee on Individual Programs, which has supervisory responsibility for Individual Programs students, provides the faculty for the Colloquium.

250 **Colloquium on Interdisciplinary Methodologies** (3) — Griffith and Staff

Analysis from several perspectives of the problems inherent in interdisciplinary study and research, conditions which justify interdisciplinary work, norms and strategies for success, and case studies. Required for all students in Individual Programs. Open to other interdisciplinary students with permission of the Colloquium Director. (Spring)

INSTITUTE FOR SINO-SOVIET STUDIES

Members of the Institute

G. Sigur *(Director)*, M. Atkin, C.F. Elliott, A. Gyorgy, H.C. Hinton, W.R. Johnson, Y. Kim, D.L. Lee, C.A. Linden, C.A. Moser, J. Pelzman, V. Petrov, C. Shih, M. Sodaro, R. Thornton, S. Wolchik, R.Y. Yin

Associate Members of the Institute

J.J. Dziak, E.M. Hadley, J. Hardt, T. Hsia, W.H. Lewis, B. Ramundo, P.A. Smith, P. True, E.L. Warner, C.L. Weber

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The Institute for Sino-Soviet Studies offers specialized graduate study in the School of Public and International Affairs. Students who lack background in Soviet and East Asian studies are required to take undergraduate courses selected by the advisor as prerequisite to graduate work. Related preparatory undergraduate courses include the following: Econ 101, 102, 133, 134, 169, 170; Hist 137, 138, 143, 144, 145, 146, 187, 188, 189, 195, 196; PSc 1, 9, 106, 107, 108, 131, 165, 168, 170, 173; Psyc 151.

For description of the objectives and programs of the Institute, see page 182.

For description of the courses listed below, see the appropriate departmental listing.

ECONOMICS

267 *Seminar: Soviet Economy* (3) — Hardt

268 *Seminar: Economic Theory and Development in Communist Countries* (3) — Hardt

269 *Economy of China I* (3) — Yin

270 *Economy of China II* (3) — Yin

271 *Economy of Japan* (3) — Hadley

281 *International Economics* (3) — Pelzman

GEOGRAPHY AND REGIONAL SCIENCE

224 *Seminar: Political Geography* (3) Pederson
265 *Seminar: Geography of the Soviet Union* (3) Staff
266 *Seminar: Geographic Perspectives on Contemporary China* (3) True

HISTORY

205 *Evolution of Nationalism in Eastern Europe* (3) Petrov
206 *Readings Seminar: Revolution in Eastern Europe* (3) Petrov
215 *Readings Seminar: Communist Monolith that Never Was* (3) Petrov
217 *Readings/Research Seminar: Russian and Soviet Thought* (3) Atkin
*232 *Comparative Communist Systems I* (3) Wolchik
*233 *Comparative Communist Systems II* (3) Wolchik
237 *Readings Seminar: Soviet Foreign Policy, 1917-1964* (3) Petrov
246 *Readings/Research Seminar: History of Modern Russia and Soviet Union* (3) Atkin
253 *Readings Seminar: History of Sino-Soviet Relations* (3) Thornton
254 *Research Seminar: History of Sino-Soviet Relations* (3) Thornton
255–56 *U.S.-Soviet Strategic Relations Since World War II* (3–3) Thornton
*258 *Communist Party of the Soviet Union* (3) Sodaro
288 *Research Seminar: History of Chinese Communism* (3) Thornton
289 *Readings/Research Seminar: Modern Japanese History* (3) Sigur
295–96 *Readings Seminar: Modern East Asian History* (3–3) Johnson

POLITICAL SCIENCE

207 *Readings in Socialism and Communism* (3) Elliott, Linden, Wolchik
208 *Readings in Marxism and Leninism* (3) Elliott, Linden
230 *Comparative Government and Politics I* (3) Kim, McClintock
231 *Comparative Government and Politics II* (3) Kim, McClintock
*232 *Comparative Communist Systems I* (3) Wolchik
*233 *Comparative Communist Systems II* (3) Wolchik
*258 *Communist Party of the Soviet Union* (3) Sodaro
263 *Communism in Non-Communist Europe* (3) Sodaro
264 *The International Politics of Eastern Europe* (3) Gyorgy
265 *Governments and Politics of Eastern Europe* (3) Gyorgy
266 *Readings in Soviet Government and Politics* (3) Elliott, Linden
267 *Soviet Government and Politics* (3) Elliott, Linden, Wolchik
268 *Soviet Foreign Policy* (3) Elliott
269 *Soviet Military Policy and Strategy* (3) Elliott
270 *Politics of the People's Republic of China I* (3) Hinton
271 *Politics of the People's Republic of China II* (3) Hinton
272 *Foreign Policy of the People's Republic of China* (3) Hinton
275 *International Politics of the Far East* (3) Kim
276 *Government and Politics of Japan and Korea* (3) Hinton
291 *Colloquium: East Asia* (3) Gyorgy
292 *Colloquium: Russia and Eastern Europe* (3)

* Joint offering of the History and Political Science Departments.

INTERNATIONAL AFFAIRS

See **Public and International Affairs.**

ITALIAN

See **Romance Languages and Literatures.**

JAPANESE

See **East Asian Languages and Literatures.**

JOURNALISM

Professorial Lecturers F.L. Dennis, C.W. Puffenbarger, J. Coldsmith, W.L. Lawbaugh
Associate Professors R.C. Willson, P. Robbins *(Chairman)*
Associate Professorial Lecturers R.L. Courage, J.P. McGill, E. Rogers, W.R. Fonda, C. Blount, R.R. Mueller, T.O. Cron, D. Haun, J.P. Martin, J.R. Fogarty, D.L. Smith, B. Taylor, S.B. Welchman

Bachelor of Arts with a major in journalism (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students planning to major in journalism should take Engl 11 rather than Engl 12 in satisfying the English composition requirement.)
2. Prerequisite courses—Engl 51–52 or 71–72; Jour 71–72; PSc 1 and 2 or 2 and 3.
3. Required courses in the major—24 hours of second-group courses in journalism, including (a) Jour 111, 196, 198; (b) nine semester hours chosen from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155; and (c) 6 semester hours chosen from Jour 115, 116, 117, 140, 141, 142, 145, 146, 150, 160, 170, 190.
4. Required as a minor area of concentration—a minimum of 18 semester hours of second-group courses, chosen in consultation with the major advisor, in one other department or field of study.

Recommended electives: Econ 121, 142, 157, 161, 162, 181–82; PSc 110, 111, 112, 114–15, 116, 118, 119, 120, 122; Psyc 115; SpDr 132, 133, 134, 135–36; Stat 53, 97, 105.

Minor in journalism—The student must complete 21 semester hours in journalism, including Jour 71 or 72; Jour 111; one course selected from Jour 115, 116, 117, or 170; three courses selected from Jour 121, 125, 133, 135, 137, 138, 139, 151, or 155; and any one other journalism course.

Departmental prerequisite: Jour 111 is prerequisite to Jour 125, 133, 135, 137, 138, 139, 190 and 196.

First Group

71–72 **Introduction to Mass Communication** (3–3) **Willson**

Jour 71: evolution of newspapers and other media in relation to political, social, and economic life; concept of press freedom. International students who lack knowledge of U.S. history should take Hist 71–72 before taking Jour 71. Jour 72: mass media, problems of contemporary journalism, emphasis on federal government-media relations. (Academic year)

Second Group

111 Reporting (3) Robbins
Gathering, evaluating, and writing news. Typing required. Laboratory fee, $10. (Fall and spring)

115 Newspaper Editing and Make-up (3) Coldsmith, Taylor
Preparation of news copy, pictures, and other graphic material for publication; evaluation of news; page layouts; newspaper make-up. (Fall and spring)

116 Magazine Layout and Design (3) Smith
Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 Magazine Editing (3) Lawbaugh
The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines. (Spring)

121 Feature Writing (3) Willson
Free-lancing nonfiction articles, materials obtained through independent investigation. (Fall)

125 Science Writing (3) Staff
Writing science news for the mass media. (Spring)

129 TV News: The Politics of Visibility (3)
Joint offering of the Departments of Political Science, Journalism, and Speech and Drama. Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. (Fall and spring)

133 Advanced Reporting: Community News (3) Puffenbarger
Coverage and writing of local news. (Fall)

135 Advanced Reporting: Consumer Affairs (3) Cron
Specialized training in the consumer news field. (Fall)

137 Advanced Reporting: National Affairs (3) Fogarty
Coverage and writing of federal government news. (Fall)

138 Investigative Reporting (3) Puffenbarger
In-depth reporting in selected areas of political, economic, and social affairs. Prerequisite: Jour 133 or permission of instructor. (Spring)

139 Advanced Reporting: Radio and Television News (3) Blount
Preparing news and public affairs programs for broadcast media. (Spring)

140 Photojournalism (3) Fonda
Taking and processing photographs for publication, picture selection, cropping, captions. Students must purchase their own film and print paper. Laboratory fee, $35. Students who received credit for Art 23 or 24 cannot receive credit for Jour 140. (Fall and spring)

141 **Intermediate Photojournalism** (3) Welchman, Haun

Advanced news and feature photography, editing, layout and photo essays. Students must purchase their own film and print paper. Laboratory fee, $35. Prerequisite: Jour 140 or Art 23 and 24. (Spring)

142 **Advanced Photojournalism** (3) Staff

Picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, $35. Admission by permission of instructor. (Spring)

145 **Principles and Problems of Public Relations** (3) McGill, Mueller

Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs. (Fall and spring)

146 **Government Information** (3) Courage

Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring)

150 **News Coverage in Washington** (3) Robbins

The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings.

151 **Editorial Writing** (3) Robbins

Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. (Spring)

155 **Critical Writing and Reviewing** (3) Martin

Reviewing and commenting on the arts and entertainment for the mass media. (Fall)

160 **New Directions of Journalism** (3) Robbins

A survey of the impact of fiction techniques on modern nonfiction reportage. Study of selected writers to identify influences and trends.

170 **News Publication Management** (3) Coldsmith

The business side of publishing. Study of the roles of advertising, circulation, promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring)

190 **Internship in Journalism** (3)

Study of a journalistic medium in action by working in a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring)

195 **Documentary Photography** (3) Battaglia

Joint offering of the Art and Journalism Departments. Historical development of documentary photography. Completion of two projects required. Laboratory fee, $36. Prerequisite: Art 23, 24; Jour 140, 141; or permission of instructor. (Fall)

196 **Senior Project** (3) Staff

Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written

request describing the project must be presented to the staff member for approval, and filed with the student's advisor in the semester before registration. (Fall and spring)

198 **Law of the Press** (3) Dennis
Freedom of the press, censorship, legislative controls, publication as contempt of court, copyright, newsgathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall)

199 **Special Topics in Journalism** (3) Staff
Selected topics: writing, editing, graphics, photojournalism, or other aspects of communication. May be repeated for credit.

JUDAIC STUDIES

Committee on Judaic Studies

D.A. Altshuler *(Chairman)*, R.H. Davison, R.G. Jones, T.Z. Lavine, B. Nimer, D. Pollock, B. Reich, H.M. Sachar, M. Ticktin, J.E. Ziolkowski

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism [see page 454].)

Bachelor of Arts with a major in Judaic Studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Clas 21–22, 23–24; Rel 9, 23.
3. Required courses for the major (30 semester hours):
   (a) Clas 103 or 104; Hist 158; PSc 179; Rel 113–14 or 115–16, 213 or 238.
   (b) two meaningfully related courses selected from each of two of the following groups: I—Anth 177, 180; Art 111, 112; II—Clas 100, 101, 102; Engl 175; III—Hist 107, 108, 110, 113, 114, 121, 122, 123, 124, 139, 140, 171, 172, 193, 194, 292, 293, 294; IV—Phil 111, 112, 113, 127, 131, 172; V—PSc 177, 178, 277, 278, 290; VI—Rel 103, 104, 105, 107, 111, 122, 126, 137, 143, 144, 145, 146, 161, 162, 172, 174, 181, 184, 209, 291, 292.

Students applying for the 90-hour degree program in Judaic Studies must, in addition to meeting the general requirements (see page 83), present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and/or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

LATIN AMERICAN STUDIES

Committee on Latin American Studies

M. Gordon *(Chairman)*, C. Allen, T.F. Carroll, J. Grunwald, R.L. Humphrey, Jr., P.F. Klarén, M. Koch-Weser, E. Marasciulo, C. McClintock, T. Morrison, P.A. Musgrove, J.W. Robb, F.R. Siegel

Bachelor of Arts with a major in Latin American Studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Anth 2, Econ 1–2, PSc 1 and 2.
3. Required courses in related areas—Span 1–2, 3–4; or equivalent. (Span 9-10 or equivalent is recommended.)
4. Required courses in the major—(a) Anth 172, 185, or 190; Econ 185; Geog 161; Hist 163–64; PSc 183–84; and six semester hours chosen from Span 151–52, 155–56, 157–58, or other approved courses; (b) 18 semester hours, including an interdisciplinary seminar (287) in one of the following areas: anthropology, economics, geography and regional science, Hispanic literatures, history or political science. The required courses listed in (a) which are in the selected area may be included in computing the required 18 semester hours for (b).

Minor in Latin American Studies—Required: one Latin American course in each of the six member disciplines (anthropology, economics, geography, history, political science, and Spanish-American literature). Two years (or equivalent) of Spanish language is prerequisite.

Master of Arts in the field of Latin American Studies—See the School of Public and International Affairs, pages 173–79.

Candidates for the degree of Doctor of Philosophy may elect Latin American history as an area of specialization in the field of history, Spanish American literature as an area of specialization in the field of Romance languages and literatures, or politics of Latin America as an area of specialization in the field of political science.

Courses Dealing with Latin America:

Anthropology—170, 172, 185, 190, 262, 268, 272, 282, 287
Economics—185, 233, 234, 251, 252, 285–86, 287
Geography and Regional Science—127, 133, 161, 223, 261, 287
History—161, 163–64, 165, 166, 261, 262, 287
Political Science—183, 184, 283, 284, 285
Portuguese—31–32
Spanish—91–92, 151–52, 155–56, 157–58, 253, 255, 256, 261, 264, 266, 287

LATIN

See **Classics.**

LITERATURE—INTERDEPARTMENTAL GRADUATE STUDIES

Committee on Interdepartmental Literature Studies

G. Ludlow *(French)*, N.N. Natov *(Slavic)*, J.A. Plotz *(English)*, J.A. Quitslund (English), P.G. Sáenz *(Spanish)*, K. Thoenelt *(German)*

Interdepartmental Literature Studies seeks to provide graduate students in departmental literature programs with a greater understanding and appreciation of the interrelated aspects of Western literatures. The courses offered are under the direction of a committee whose members are drawn from the various modern literature departments within the University.

Courses are offered for Masters (non-thesis) and doctoral candidates in one or more of the following literatures: English, French, German, Russian, Spanish, and Spanish-American. Participating departments have agreed that candidates for graduate degrees may take a maximum of 6 semester hours of course work outside their own department as credit towards their Masters and doctoral degrees. Courses in foreign literatures are conducted in English and/or the

foreign language, at the discretion of the instructor. All courses are open to qualified undergraduate students as elective credit when taken outside of the major field. Students should consult with the departmental committee member and the course instructor before selecting courses.

For description of the courses listed below, see the appropriate departmental listing. Course offerings will not be restricted to the present listing.

ENGLISH

125–26 *Elizabethan Verse and Prose* (3–3)	Quitslund
133–34 *The Romantic Movement* (3–3)	Plotz
157 *20th-Century Drama* (3)	Paster
225–26 *Studies in 16th-Century English Literature* (3–3)	Quitslund
233–34 *Studies in the Romantic Movement* (3–3)	Plotz

GERMAN

111–12 *Comparative Studies in Germanic Literatures* (3–3)	Thoenelt
126 *France and Germany* (3)	Thoenelt
161 *Directed Readings in German Literature I* (3)	King

ROMANCE LANGUAGES AND LITERATURES

French

135 *Comparative Medieval European Literature* (3)	Cruz-Sáenz
229–30 *Literary Renaissance in Europe* (3–3)	Burks
241 *The Age of Enlightenment in Europe* (3)	Ludlow
242 *Seminar: The French Novel and Theater in the 18th Century* (3)	Ludlow

Spanish

135 *Comparative Medieval European Literature* (3)	Cruz-Sáenz
137 *The Spanish Civil War and the Creative Artist* (3)	Barnett

SLAVIC LANGUAGES AND LITERATURES

128 *Dostoevsky: The Man and the Artist* (3)	Natov
156 *Leo Tolstoy: His Life and Works* (3)	Rowe

MANAGEMENT SCIENCE

Professors M.M. Wofsey *(Emeritus)*, R.F. Ericson, G.L. Lippitt, D.D. Roman, P.B. Vaill, J. Harvey, E.B. Adams

Professorial Lecturers T. O'Connor, R.H. Walther, Z.A. Shavell

Associate Professors J.F. McCarthy, Jr., R.L. Holland, E.K. Winslow *(Chairman)*, W.E. Smith, W.W. Hardgrave, J.P. Coyne, E.H. Forman, C.J. Testa, S. Umpleby, E.W. Hahn, W.E. Halal, J. Lobuts, Jr., J.H. Carson, L. Graff

Assistant Professor J.D. Frame

Programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Master of Science in Information

Systems Technology, Doctor of Business Administration, and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 135–64).

Second Group

107 **Fundamentals of Behavioral Science** (3) Lobuts

Survey of behavioral science research and practice as related to management. Emphasis on the basic human processes which contribute to the functioning of organizations.

118 **Introduction to Information Processing** (3) Smith, Coyne, Forman

Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher level language (FORTRAN) and are run on the SGBA computer. Laboratory fee, $25.

119 **Computer Programming for Information Systems** (3) Smith, Testa

COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts, flow charting, and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 118 or Stat 97. Laboratory fee, $25.

120 **Information Systems Development I** (3) Coyne, Smith

Assessment of the systems concept and its relationship to organizational information decision-making and management. Concepts and techniques involved in the initial development of new or revised computer-based information systems, e.g., systems analysis and design phases. Prerequisite: Mgt 118, 119; or permission of instructor. Laboratory fee, $25.

121 **Information Systems Development II** (3) Testa, Smith, Coyne

A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 120 or permission of instructor. Laboratory fee, $25.

122 **Special Studies in Information Systems** (3) Smith, Coyne

An independent or group-study project in information systems development which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 121 or permission of instructor.

Third Group

200 **Organization and Management** (3) Adams, Halal, Vaill, Roman

For designated students in the MBA program. Integrative approach to organizational concepts, management principles, philosophy and theory in public and private organizations. Evolution of management thought, functions, and practices, stressing present management approaches, general systems theory, and contingency management.

201 **Contemporary Issues in Management** (3) Adams, Ericson, McCarthy, Brown, Roman, Halal, Loeser, Vaill

An advanced management course designed to explore contemporary issues of organizations and management. Current literature and recent research findings will be analyzed. Topics include productivity, social responsibility, government regulations, consumerism, and employee participation. Prerequisite: Mgt 200 or equivalent.

210 **Individual and Group Dynamics in Organizations** (3) Lippitt, Harvey, Winslow, Vaill

(Formerly Mgt 207)

For graduate students who wish to improve their skills in dealing with human behavior in organizations. Theoretical and personal understanding of the roles of interpersonal and group dynamics in management. Focus on individuals and groups in various organizational settings. Intensive work group experience focusing on theory, research, and group analysis.

211 **Current Issues in Organizational Behavior** (3) Winslow

(Formerly Mgt 208)

Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems. Problems in behavioral science research. Prerequisite: Mgt 210.

212 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow

(Formerly Mgt 210)

Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learning in various settings and to demonstrate competence in various media. This course emphasizes the relationship between theory and practice. Prerequisite: Mgt 210 or permission of instructor.

213 **Organizational Development: Concepts and Methods** (3) Lippitt, Harvey, Vaill

(Formerly Mgt 212)

Primarily for doctoral students. Examination of different concepts of organizational structure, processes, and growth. Models of organizational change will be developed with a taxonomy of methods of initiating action to further organizational development. Prerequisite: Mgt 210, 212; or equivalent. (Fall)

214 **Consultative Processes in Organizations** (3) Lippitt, Harvey

(Formerly Mgt 213)

Primarily for doctoral students. Examination through actual practice, as well as theory, of the nature of the helping process between one person or group and another person or group. Dynamics of the consulting process will be explored as well as role differences in internal and external consultation. Development of skill in the helping relationship will be furthered. Prerequisite: Mgt 210, 212; or equivalent. (Spring)

218 **Computer Programming with Business Applications** (3) Smith, Hahn, Coyne

For designated students in the MBA program. Basic principles, terminology, and organization of computer systems. Emphasis on de-

veloping a proficiency in the use of higher-level programming language via computer solutions to production management and accounting problems. Laboratory fee, $25.

220 **Quantitative Factors in Administration** (3) Hahn, Forman, Hardgrave
(Formerly Mgt 204)

Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application; use of the computer in solving such models. Linear programming, probability, decision-making under uncertainty, queuing and inventory models, simulation. Prerequisite: Mgt 202, 218, or equivalent. Laboratory fee, $10.

221 **Introduction to Probability Theory and Applications** (3) Hardgrave, Hahn, Forman
(Formerly Mgt 225)

Introduction to probability theory and its applications in management science and operations research; foundation course for further study of advanced probabilistic methods in operations research. Sample spaces, conditional probability, common distributions, random variables, simple stochastic processes. Prerequisite: Math 52 or 54, or equivalent. (Fall)

222 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Forman, Hahn
(Formerly Mgt 227)

Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Math 52 or 54, or equivalent. Laboratory fee, $10. (Fall)

223 **Techniques of Operations Research** (3) Hardgrave, Forman, Hahn
(Formerly Mgt 228)

Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 221, 222. (Spring)

229 **Modeling in Applied Operations Research** (3) Hardgrave

Advanced modeling exercises in applied operations research. Prerequisite: Mgt 223 or permission of instructor. (Spring)

230 **Administration of Research and Development** (3) Roman, Frame

Examination of technological, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement and evaluation. (Fall and spring)

232 **International Research and Development** (3) Roman, Frame

Technological, political, social, and economic factors affecting international R&D policy; problems in industrial, governmental, and international organizations; world technological forecasting; resource

allocation; technology transfer. Prerequisite: Mgt 230 or permission of instructor. (Fall and spring)

233–34 **Technology Assessment Theory and Practice** (3–3) Frame

Mgt 233: the technology assessment concept. Methods for conducting assessments. Management of assessments. Evaluation of selected assessments. Mgt 234: planning and conducting a technology assessment. Prerequisite to Mgt 234: Mgt 233 or permission of instructor. (Academic year)

235 **Technological Entrepreneurship and Innovation** (3) Roman, Frame

The complex decision process in innovation, including choice of technology to develop, evaluation of the state-of-the-art, evolutionary or revolutionary technological change, market appraisal, risk factors, product control, the national and international political and economic environment, and competition. Advantages of technological innovation, how it takes place, and what environmental and operational factors serve as stimulants or barriers. (Spring)

239 **Seminar: Administration of Research and Development** (3) Roman, Frame

Individual and/or group in-depth research projects dealing with various phases of research and development management. Topic will vary each time the course is offered according to the emerging technology, current operational problems, and student interest. Prerequisite: six to nine semester hours of research and development management or permission of instructor. (Fall)

240 **Survey of Information Technology** (3) Smith, Adams, McCarthy, Testa

Management-oriented survey of key areas in information technology including hardware, software, systems development, management and the computing milieu. Prerequisite: Mgt 218. Laboratory fee, $25.

241 **Information Systems Development and Application** (3) McCarthy

An advanced course in information technology, emphasizing philosophies, principles, and practices common to the development and application of information systems. Different approaches are studied, case study materials are evaluated, and the various roles of the technical staff are considered. Prerequisite: Mgt 118. (Fall and spring)

242 **Comparative Computer Systems** (3) Coyne

Characteristics and capacities of the range of information processing equipment in use today. Recent and prospective equipment and software development. Selection of computers and related software and equipment. Prerequisite: Mgt 240 or permission of instructor. (Spring)

243 **Management of Information Technology** (3) Adams

Advanced course emphasizing principles, practices, and trends in the management of information technology. Case studies. Prerequisite: Mgt 240, 242; or permission of instructor. (Fall)

244 **Information Systems and Telecommunications** (3) Carson, Forman, Smith

Principles of telecommunications; applications of telecommunications for the transmission of data communications to enhance the flow of

information within an organization. Identifying opportunities for applying technology in ways that will support the efforts of an organization. Terminology, hardware and software considerations, and calculations necessary for the specification and design of telecommunication systems. Prerequisite: Mgt 118. (Fall)

245 **Data Base Systems** (3) Coyne, Smith, Testa

An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective data base system. Topics include data base organization, creation, and maintenance; evaluation criteria; standardization of data base systems; impact of packaged data management systems; and analysis of the current state-of-the-art in data base development. Prerequisite: Mgt 118. Laboratory fee, $25. (Fall and spring)

246 **Workshop in Data Base Systems** (3) Testa, Forman, Smith, Coyne

Analysis and solution of complex information problems through commercially available data base systems; development of evaluation methodology, comparison of implementation strategies. "Hands-on" experience with at least four major commercial systems. Prerequisite: Mgt 119, 245. Laboratory fee, $25. (Spring)

247 **Higher-Level Programming Languages for Information Systems** (3) Forman, Smith, Coyne

Use of major programming languages in information technology. Topics for each language include syntax and semantics, ease of learning, coding and debugging, documentation standards and maintenance, suitability for particular problem areas and projected users; availability of languages on large-scale through minicomputers. A comparative analysis of these language and conversion problems is also discussed. Prerequisite: Mgt 118. Laboratory fee, $25. (Fall)

248 **Design of On-Line Information Systems** (3) Coyne, Forman, Smith

Introduction to the analysis, design, and implementation of on-line business information systems. Topics include requirements analysis, functional specifications, file design, man-machine dialogue design, response time requirements, user psychology, human channel and buffer capacity. Prerequisite: Mgt 244; Math 51, 52. (Spring)

249 **Seminar: Information Technology** (3) Adams, McCarthy

Current problems in the design and implementation of computer-supported systems; emphasis on current state-of-the-art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 240, 242, 243; or permission of instructor. (Spring)

250 **Operating Systems** (3) Carson, Testa, Smith

Principles of operating systems; role of the operating system in resource allocation activities inherent in large-scale digital computers. The specialized functions of these systems are defined, and logical requirements of each are specified, including data structuring, multiprogramming, I/O spooling, and job control. Commercial operating systems will be studied as examples. Prerequisite: Mgt 120, 121. (Fall)

251 **Microcomputer Applications** (3) Hahn, Carson, Forman

An in-depth approach to the understanding and use of microcomputer systems. Principles of microcomputers and distinguishing characteris-

tics among various microcomputer systems. Students work individually with the microcomputer system in the laboratory. Prerequisite: Mgt 122. Laboratory fee, $25. (Spring)

252 **Information Resources Management** (3) Adams, McCarthy

Information resources as a management function that develops and implements a set of policies, programs, and procedures to efficiently and effectively plan, manage, and control substantive information resources and the supporting information handling technologies. Concepts and tools for integration of information systems and management systems. Information as a resource, cost and value assessments, budgeting and accounting structures, and evaluating information. Prerequisite: Mgt 200, 240.

253 **Security and Privacy of Information Systems** (3) Adams, Forman, Wofsey

An advanced course in information technology, emphasizing the philosophies, principles, and practices of security management in and the impact of privacy legislation on computer-based systems. Case study materials are evaluated in completing a management-of-risk project. The roles of the various levels of management and technical staff are considered. Prerequisite: Mgt 218 or 240.

260 **Introduction to General Systems and Cybernetics** (3) Umpleby, Ericson, Adams

Analysis of fundamental general systems and cybernetic concepts evolving in various branches of knowledge and academic disciplines, emphasizing their transcontextual and interdisciplinary nature, e.g. stability, equilibrium, homeostasis, feedback, regulation, equifinality, self-organization, variety, uncertainty, redundancy, paradox, first- and second-order cybernetics, and self-reference.

261 **Fundamentals of General Management Systems and Organizational Cybernetics (GEMSOC)** (3) Ericson, Adams, Umpleby

Dynamics of organization and management from a general systems and cybernetics viewpoint. Translation of GEMSOC research and theory into the world of organizational behavior and management practice. Prerequisite: Mgt 260 or permission of instructor.

263 **Case Studies and Field Research in GEMSOC** (3) Ericson, Adams, Umpleby

Investigation of existing organizational structures and ongoing management processes from a GEMSOC standpoint. Operational evaluations of firms and agencies, including intercontextual comparative studies. Prerequisite: Mgt 261.

264 **GEMSOC Modeling and Simulation** (3) Umpleby, Adams, Ericson

Literature review and current practice analysis; modeling and simulation exercises. Continuous and discrete representations: system dynamics, set theory, kinematic graphs, information theory. Prerequisite: Mgt 261.

270 **Mathematics and Statistics for Management** (3) Hahn, Forman, Graff, Hardgrave

(Formerly Mgt 202)

For designated students in the MBA program. Mathematical and sta-

tistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus and linear algebra. Introduction to probability, frequency distributions, statistical inference, regression, and correlation.

275 **Managerial Statistics I** (3) Forman, Hahn, Hardgrave
(Formerly Mgt 295)
Statistical methods and their applicability to management. Topics include sampling, estimation, hypothesis testing, regression and analysis of variance. The student will learn how to utilize computer software packages in applying the statistical techniques. Prerequisite: Mgt 202 and 218 or equivalent. Laboratory fee, $25.

276 **Managerial Statistics II** (3) Forman, Hahn, Hardgrave
(Formerly Mgt 296)
Statistical modeling of management applications. Topics include multiple regression, analysis of variance, analysis of covariance, survey design and forecasting. The student will learn how to utilize computer software packages for statistical modeling. Prerequisite: Mgt 275 or permission of instructor. Laboratory fee, $25.

290 **Special Topics in Management Science** (3) **Staff**
Experimental offering; new course topics and teaching methods. May be repeated once for credit. Laboratory fee may be imposed, depending on requirements. (Fall or spring)

298 **Directed Readings and Research in Management Science** (3) Staff
(Fall and spring)

299 **Thesis Seminar** (3) **Staff**
(Fall and spring)

300 **Thesis Research** (3) **Staff**
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society. (Academic year)

314 **Interpersonal and Group Dynamics** (3) Harvey
A laboratory education course, employing experience-based learning, designed to help participants learn about their impact on others and the dynamics of small group and intergroup behavior. Prerequisite: Mgt 210, 211, 212, or equivalent, and permission of instructor.

315 **Interdisciplinary Problem Solving in Macro Systems: The Multocular Process** (3) Lippitt
Exploration of the utilization of cross-disciplinary representatives applying a particular problem-solving process when coping with

complex problems. Such problems are defined as those having impo
on large numbers of persons. Students will conduct experiment
using the process, applying it to a real situation, and developin
scenarios. Prerequisite: Mgt 210, 211, 212, 213, or equivalent, an
permission of instructor.

325 **Seminar: Statistics and Probability** (3) Hardgrave
Special topics and advanced applications in statistics and probability
such as factor analysis, exploratory data analysis, or Box-Jenkins
forecasting. May be repeated once for credit. Prerequisite: Mgt 22
and 295, or permission of instructor.

328 **Seminar: Operations Research** (3) Hardgrave
Special topics and advanced applications in operations research,
such as fuzzy set theory, catastrophe theory, or Markovian decision
processes. May be repeated once for credit. Prerequisite: Mgt 228 or
permission of instructor.

365 **Research Seminar in GEMSOC Theory** (3) Umpleby, Adams, Ericson
Advanced seminar on recent advances in GEMSOC. Examination of
the sources of systems concepts in traditional fields; extension of
existing theory into new areas. Prerequisite: Mgt 261.

366 **Philosophic and Policy Issues in Institutional Articulation** (3) Ericson
Need for greater institutional coherence of managerial decision-
making in an "only one world" frame of reference. Systemic articula-
tion and metasystemic integration: the planned evolution of more ef-
fective institutional forms. Institutional sovereignty, organizational
morality, and human values: the search for general systemic opti-
mality. Prerequisite: Mgt 365.

390 **Philosophical Foundations of Administrative Research** (3) Lauter, Vaill
Philosophy of science as applied to research in administration.
Topics include the nature and current problems of epistemology, the
development and role of theories, and the relationship between
theory, methodology, and empirical data. (Fall and spring)
Lauter

391 **Methodological Foundations of Administrative Research** (3)
Examination of the process of social science research. Use of models
and theoretical frameworks in research; formulation of research
questions, hypotheses, operational definitions, research design,
sampling methods, and data analysis approaches. Primary emphasis
on the development of dissertation proposals. (Spring)
Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the general examination. May be
repeated for credit. (Fall and spring)
Staff

399 **Dissertation Research** (arr.)
May be repeated for credit. (Fall and spring)

MATHEMATICS

Professors D. Nelson, T.P.G. Liverman *(Chairman)*, H. Kenyon, C. Taam, R.L.A. Bari, I. Katz, H.D. Junghenn
Adjunct Professor J. Eftis
Professorial Lecturers D.M. Dribin, P.L. Hayes
Associate Professors W.A. Smith *(Emeritus)*, D.R.K. Henney, I.I. Glick, M.D. Green, M.P. Lee, E.A. Stone
Associate Professorial Lecturers C.M. Chambers, Y. Akiyama, M.A. Montemezzi, A. Heidrich
Assistant Professor M.M. Gupta
Assistant Professorial Lecturer R.E. O'Brien
Lecturers B.E. Gammon, D.A. Kriegman

Bachelor of Arts or Bachelor of Science with a major in mathematics (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 106, 121, 123, 139 and 140. It is also strongly recommended that students take French, German, or Russian, and mathematically related courses in such subjects as physics, statistics, economics and engineering.

Bachelor of Arts or Bachelor of Science with a major in applied mathematics (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31, may be waived upon examination before registration.)
3. Required courses in related areas:
(a) Stat 189–90.
(b) Eighteen semester hours to be selected, in consultation with the department advisor, from social and management sciences, engineering and physical sciences, or computer sciences. At least 12 semester hours must be chosen from one area, and at least six semester hours must be chosen from courses numbered 101 or higher. For courses in applied science, civil engineering, electrical engineering and computer science; engineering administration, mechanical engineering, and operations research, see the *School of Engineering and Applied Science Bulletin*.
4. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 111, 112, 139, 140, 181–82. It is also strongly recommended that students take French, German, or Russian.

Master of Arts in the field of mathematics—Prerequisite: a bachelor's degree with a major in mathematics from this University, or an equivalent degree.
Required: the general requirements, pages 91–99. Students must complete 30 semester hours of approved course work, with or without a thesis, and must pass a comprehensive examination.

Master of Arts or Master of Science in the field of applied mathematics—Prerequisite: a bachelor's degree with a major in mathematics or a related field such as statistics, a physical science, engineering, or economics.
Required: the general requirements, pages 91–99. Course work is divided between mathematics courses and courses from one area of application—economics, engineering (civil, computer science, electrical, engineering administra-

tion, mechanical, or operations research), physics, statistics, or urban and regional planning. Courses in the chosen area of application are selected in consultation with the relevant department.

Candidates for the degree of Master of Arts must complete 30 semester hours of approved course work, including Math 299–300 *Thesis Research*, and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 hours of these from second-group courses. The remaining courses are chosen from the selected area of application. Theses are jointly supervised by the department of mathematics and the department concerned with the area of application.

Candidates for the degree of Master of Science must complete 30 semester hours of course work and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than six semester hours from second-group courses. There is no thesis requirement.

Master of Science for Teachers—Prerequisite: A bachelor's degree; at least 12 semester hours or equivalent in mathematics courses, including the equivalent of Math 31; experience in teaching mathematics at the secondary school level.

Required: 30 semester hours of approved second- or third-group mathematics courses, including Math 168.

Doctor of Philosophy in the field of mathematics—Required: the general requirements, pages 91–94, 99–101. The department doctoral program committee, after consultation with the student, will stipulate (1) courses which must be taken to fulfill the 48-semester-hour requirement leading to the General Examination; (2) the two languages, selected from French, German, or Russian, which must satisfy the foreign language requirement; and (3) the four areas of study in which the student must prepare for the General Examination. The doctoral program committee will appoint a Director of Research when the student has selected (preferably early in the program) one of the following research fields for the dissertation: functional analysis (abstract differential equations, functional equations, generalized functions, groups of operators, group representations, linear algebra (matrix theory), logic, measure and integration, ordinary and partial differential equations, theory of numbers, and topology (general topology, analytic topology, topological groups).

Bachelor of Arts in Education and Human Development with a teaching field in mathematics—Prerequisite: the education curriculum, pages 114–15.

Required: the mathematics option and the professional courses listed on page 119.

First Group

***3 College Algebra** (3) Morris and Staff

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring)

***6 Plane Trigonometry** (3) Morris and Staff

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor). (Fall and spring) Staff

***9 General Mathematics I** (3)

Logic, sets, foundations of the number system, abstract mathematical systems, groups. (Fall and spring)

* The School of Government and Business Administration does not accept credit for this course toward the B.B.A.

10 **General Mathematics II** (3) — Staff

Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices. (Fall and spring)

30 **Precalculus** (3) — Bari and Staff

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

31 **Single-Variable Calculus I** (3) — Kenyon and Staff

Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent.* (Fall and spring)

32 **Single-Variable Calculus II** (3) — Kenyon and Staff

Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; 3-dimensional vectors. Prerequisite: Math 31. (Fall and spring)

33 **Multivariable Calculus** (3) — Kenyon and Staff

Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

41 **Calculus for Economists I** (4) — Junghenn

Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent.* (Fall and spring)

42 **Calculus for Economists II** (4) — Junghenn

Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41. (Fall and spring)

†51 **Mathematics for the Social and Management Sciences I** (3) — Glick and Staff

Solution of systems of linear equations; notion of function; graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration. (Fall and spring)

†52 **Mathematics for the Social and Management Sciences II** (3) — Glick and Staff

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; matrix algebra, linear programming; difference equations and mathematics of finance. Prerequisite: Math 51. (Fall and spring)

* Math 30 may be waived as a prerequisite by examination on scheduled dates.

† Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52.

Second Group

101 Introduction to Mathematical Logic (3) Nelson
Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Fall)

102 Axiomatic Set Theory (3) Nelson
Zermelo-Fraenkel set theory, ordinals and cardinals, foundations of the real number system. Prerequisite: Math 101 or permission of instructor.

104 Mathematics and Human Thought (3) Dribin
Philosophical and historical aspects of mathematics and its interplay with other disciplines from antiquity to modern times. Prerequisite: two years of high school mathematics. (Spring, even years)

106 Introduction to Topology (3) Kenyon and Staff
Prerequisite: Math 139 or permission of instructor. (Spring)

107 Introduction to Algebraic Topology (3) Bari
Prerequisite: Math 122 and 139, or permission of instructor.

111 Mathematics for Engineers and Physicists I (3) Stone and Staff
Differential equations. Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33. (Fall)

112 Mathematics for Engineers and Physicists II (3) Stone and Staff
Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111. (Spring)

113 Graph Theory (3) Bari
Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 Introduction to Abstract Algebra (3–3) Katz
Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

123 Linear Algebra (3) Lee
Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. Prerequisite: Math 121. (Fall)

124 Introduction to Matrix Theory (3) Junghenn and Staff
Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor. (Fall and spring)

125 **Linear Programming** (3) Katz
Simplex algorithm, degeneracy, the assignment problem, duality theorems, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent.

134 **Introduction to Boundary-value Problems** (3) Gupta and Staff
Prerequisite: Math 111 or 142. (Spring, even years)

135 **Projective Geometry** (3) Dribin
Prerequisite: Math 123 or 124, or equivalent.

139 **Advanced Calculus I** (3) Liverman
Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall)

140 **Advanced Calculus II** (3) Liverman
Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent. (Spring)

141 **Advanced Calculus III** (3) Glick and Staff
Tensors, differential forms, Stokes theorem, introductory differential geometry. Prerequisite: Math 140.

142 **Introduction to Differential Equations** (3) Taam
Linear and some nonlinear differential equations. Topics include existence theorems, stability, control theory, limit cycles, and applications to physics and ecology. Prerequisite: Math 139 and 123 or 124, or permission of instructor. (Fall)

153 **Introduction to Numerical Analysis I** (3) Gupta
Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations. Sparse matrices. Solution of nonlinear equations. Interpolation and approximate representation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming. (Fall, even years)

154 **Introduction to Numerical Analysis II** (3) Gupta
Numerical differentiation and integration. Solution of ordinary differential equations. Introduction to optimization theory, gradient techniques. Least squares and applications, data fitting. Prerequisite: Math 153 or permission of instructor. (Spring, odd years)

157 **Introduction to Complex Variable Theory** (3) Henney and Staff
Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

168 **Seminar: Curriculum Studies** (3) Bari and Staff
Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite: Math 31 and permission of instructor.

181–82 **Seminar: Applied Mathematics** (3–3) Hayes, Glick
Prerequisite: Math 140, Stat 189–90, some knowledge of linear alge-

bra, senior status as major in Applied Mathematics. (Academic year)

Staff

191 Special Topics (arr.)
Admission by permission of instructor. May be repeated for credit. Offered upon demand.

Staff

195 Reading and Research (arr.)
Under the personal direction of an instructor. Limited to mathematics and applied mathematics majors with demonstrated capability. Prior approval of instructor required. May be repeated for credit. (Fall or spring)

Third Group

Courses marked with an asterisk (*) are offered every year.

ALGEBRA

Lee

***201–2 Modern Algebra I and II** (3–3)
Fundamental concepts of groups, rings, and fields. (Academic year)

Lee

203 Modern Algebra III (3)
Galois theory and valuation theory.

Lee

204 Representation Theory (3)
Representations of groups and algebras.

Katz

205 Matrix Theory (3)
Topics chosen from the following: inequalities, non-negative matrices and their applications, infinite dimensional vector spaces, multilinear algebra, bilinear and quadratic forms.

Staff

206 Topics in Algebra (3)

ANALYSIS AND APPLIED MATHEMATICS

Liverman and Staff

***211 Complex Analysis I** (3)
Topology of complex numbers; elementary functions; integrals; Cauchy's theorem; maximum modulus and Liouville theorem; Taylor and Laurent series; classification of singularities; contour integration; the residue theorem; continuation, multivalued functions, and branch points. Prerequisite: advanced calculus. (Fall)

Henney and Staff

212 Complex Analysis II (3)
Harmonic functions, partial fractions. Mittag-Leffler theorem; entire functions, the Hadamard product theorem, the gamma function. Hurwitz's theorem, normal families of functions. The Riemann mapping theorem; analytic continuation, Riemann surfaces. Prerequisite: Math 211 or equivalent.

Liverman and Staff

213 Applications of Complex Analysis (3)
Topics chosen from potential theory and conformal mapping, special functions, asymptotic expansions; steepest descent, stationary phase and WKB methods, Fourier and Laplace transforms, Wiener-Hopf method, dual and singular integral equations. Prerequisite: Math 211 or an undergraduate course in complex variables.

*214 **Measure and Integration Theory** (3) Junghenn and Staff

Lebesgue measure and integration in abstract spaces. Probability measures. Absolute continuity; Radon-Nikodym theorem; measure on product spaces; Fubini theorem. L^p spaces. Prerequisite: advanced calculus. (Spring)

*215 **Introduction to Functional Analysis** (3) Taam

Topological and metric spaces; Tychonoff theorem; completion of a metric space; Normed and Banach spaces; linear functionals and operators; Hahn-Banach theorem; principle of uniform boundedness; the closed-graph theorem and interior mapping principle; Hilbert spaces; eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus of functions defined on the spectrum. Prerequisite: advanced calculus. (Fall)

216 **Banach Algebras and Special Theory of Operators** (3) Taam

Gelfand theory of commutative Banach algebras; function algebras, Stone-Cech compactification; application to the spectral theory of operators, spectral theorem for bounded and unbounded operators. Prerequisite: knowledge of measure and integration, introduction to functional analysis, and Tychonoff and Stone-Weierstrass theorem.

217 **Introduction to Ordinary Differential Equations** (3) Glick and Staff

First course in ordinary differential equations; existence and uniqueness of solutions; continuity of solutions with respect to initial conditions; properties of linear systems. Prerequisite: advanced calculus. (Fall, even years)

218 **Topics in Ordinary Differential Equations** (3) Staff

Topics to be chosen from stability theory, non-linear oscillations, equations with delays.

219–20 **Techniques of Partial Differential Equations** (3–3) Liverman

Math 219: Linear first- and second-order equations. Applications to probability theory and mathematical physics. Prerequisite: knowledge of advanced calculus and rudiments of linear algebra and complex variables. Math 220: First-order equations and systems. Characteristics and bi-characteristics. Variational and transform methods. Integral equations and boundary-value problems. Prerequisite: Math 219, knowledge of undergraduate linear algebra and analytic function theory.

221 **Calculus of Variations** (3) Staff

Introduction to the calculus of variations via the notion of the Fréchet derivative, the Euler equations, the Hamilton-Jacobi equations; sufficient conditions for a solution to exist, applications to mechanics and physics, control theory.

222 **Introduction to Numerical Analysis** (3) Gupta

Computer arithmetic and round-off errors. Solution of linear systems and nonlinear equations. Interpolation and approximations. Numerical differentiation and integration. Eigenvalues and eigenvectors. Prerequisite: knowledge of advanced calculus and computer programming. (Fall, odd years)

223 **Numerical Solution of Ordinary and Partial Differential Equations** (3) Gupta

Initial and boundary value problems for ordinary differential equa-

tions. Error propagation, convergence and stability. Finite difference and finite element methods for partial differential equations. Prerequisite: knowledge of differential equations and computer programming. (Spring, even years)

224 **Generalized Functions and Operational Methods** (3) Liverman
Theory of Schwartz distributions. Operational calculus of generalized functions. Generalized function Fourier series, Fourier and Laplace transforms, applications to initial and boundary-value problems. Prerequisite: advanced calculus.

225 **Theory of Generalized Functions and Distributions** (3) Liverman
Fréchet and countable union spaces; structure, and properties of Schwartz distributions and Gelfand-Silov generalized functions; applications to explicit solutions and existence theory of ordinary and partial differential equations, nested Hilbert spaces; generalized Fourier transform. Prerequisite: Math 211 or permission of instructor.

226 **Control Theory** (3) Glick
Optimal control of linear systems, control of linear systems with convex cost functionals, the maximal principle and selected topics on control systems.

227–28 **Introduction to System Theory** (3–3) Staff
Analysis of discrete and continuous systems of various types. States and system dynamics and problems of control, optimization and stability. Prerequisite: background in advanced calculus and linear algebra.

229 **Mathematical Programming** (3) Katz
Simplex methods, including discussion of degeneracy. Duality theory-applications to the transportation and assignment problems. Non-linear programming, including dynamic and geometric programming

230 **Topics in Analysis** (3) Jungheno
Invariant means on semi-groups. (Offered as the demand warrants)

231 **Topics in Applied Mathematics** (3) Liverman and Staff
Modern treatment of integral transforms. Fourier, Laplace, Mellin and Hilbert transforms of functions and generalized functions. Applications to O.D.E., P.D.E, and integral equations of applied mathematics, physics, and engineering. (Spring)

232 **Topics in Numerical Analysis** (3) Gupta
Finite element methods. (Offered as the demand warrants)

241–42 **Mathematical Foundations of Stochastic Processes** (3–3) Jungheno
Fundamentals and applications of stochastic processes, beginning with a rigorous development of the requisite measure theory, probability theory, and Fourier analysis on R^n, and culminating in an in-depth study of Martingales, Markov processes, Brownian motion, and Poisson processes. Applications will be made to the life sciences, physics, engineering, and gambling. Prerequisites: advanced calculus and linear algebra.

COMBINATORIAL MATHEMATICS

261 **Combinatorics** (3) Bari

Generating functions, recurrence relations, counting theorems. Selected topics. Applications to statistical mechanics, information theory, design of experiments, operations research, linear and dynamic programming, network theory. Prerequisite: undergraduate modern algebra and linear algebra. (Spring, odd years)

262 **Graph Theory** (3) Bari

Electrical and other networks, matroids, chemical isomers, crystal structure, linear programming, operations research, Markov chains, Feynman diagrams, selected topics in graph theory from introductory topics to problems currently of research interest. (Spring, even years)

263 **Topics in Combinatorial Mathematics** (3) Staff

LOGIC

*271 **Introduction to Mathematical Logic** (3) Nelson

Propositional and predicate calculus (first order): syntax, formation rules, semantics, axioms, proof and deduction, object vs. metalanguage, deduction theorem, compactness theorem, Gödel-Henkin completeness theorem, Craig's interpolation theorem, Beth's definability theorem. First-order recursive arithmetic: incompleteness and undecidability. (Fall, odd years)

272 **Topics in Logic** (3) Nelson

Selected topics from recursive function theory, model theory, set theory, or proof theory.

TOPOLOGY

*281–82 **General Topology** (3–3) Kenyon and Staff

General topological spaces, separation axioms, compactness and connectedness. Metrization, uniform spaces, and complete spaces. (Academic year)

283–84 **Topological Groups** (3–3) Green

General theory of topological groups; uniform structures on groups, products and inverse limits. Locally compact groups, classical linear groups and Lie groups. Prerequisites: General topology including uniform spaces, linear algebra, and real and complex variables. Prerequisite: general topology including uniform spaces, linear algebra, and elementary group theory.

285 **Topological Vector Spaces** (3) Junghenn

Vector space topologies, linear manifolds, metrizability and complexification. Locally convex topological vector spaces, projective and inductive topologies, barrelled and bornological spaces. Prerequisite: general topology including uniform spaces, linear algebra, and real and real and complex variables.

287 **Differentiable Manifolds I** (3) Glick

Differentiable manifolds, tangent vectors, sub-manifolds, imbeddings and immersions, vector fields and differential equations on manifolds,

tensors and differential forms, Lie derivatives, orientability. (Fall—offered as the demand warrants)

Glick

288 **Differentiable Manifolds II** (3)
Manifolds with boundary, integration on manifolds, Stoke's theorem and the divergence theorem, the Brouwer fixed-point theorem, deRham groups, Riemannian manifolds, geodesics, curvature. (Spring—offered as the demand warrants)

Staff

289 **Topics in Topology** (3)

RESEARCH

Staff

*295 **Reading and Research** (3)
May be repeated once for credit. (Fall and spring)

Fourth Group

Staff

*398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

Staff

*399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MICROBIOLOGY—GRADUATE PROGRAMS

Professors R. Hugh, E.M. Lerner II *(Research)*, L.F. Affronti *(Chairman)*, K. Huang, M. Reich, P.D. Kind
Associate Professor G.V. Stokes
Associate Professorial Lecturer R.F. DeGiovanni-Donnelly

Master of Science in the field of microbiology—Prerequisite: a bachelor's degree with a major in biological or physical sciences from this University, or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BiSc 11–12; Chem 11–12, 151–52, 153–54; Math 30, 31 (31 may be taken concurrently with the graduate program); Phys 1, 2.

Required: the general requirements, pages 91–99. A total of 30 semester hours is required, 24 hours of course work and six hours of thesis (Micr 299–300). The course work must include Micr 211 (if not taken prior to admission), plus Bioc 221–22; Micr 277–78; and completion of the biostatistics tool requirement. The remaining academic work should consist of graduate-level courses selected with the approval of the department.

Doctor of Philosophy in the field of microbiology—Required: the general requirements, pages 91–94, 99–101. Candidates must fulfill the tool requirement by completing biostatistics and by either passing a reading knowledge examination in French or German, or completing satisfactorily six semester hours in an approved tool option such as electron microscopy. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

Research fields: clinical microbiology, determinative bacteriology, immunochemistry, immunology, microbial genetics, microbial pharmacology, microbial physiology, and virology.

211 Microbiology (4) — Staff

Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

212 Pathogenic Bacteriology (3) — Hugh

Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial diseases of man. Prerequisites: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 Tissue Cell Culture and Somatic Variation (3) — Staff

Fundamental aspects of the culture of animal, plant, and insect cells. Specialized techniques and applications of tissue culture procedures. Prerequisite: Micr 211 or equivalent. (Spring)

215 Medical Parasitiology (2) — Staff

Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 Scientific Writing (1) — Wagner*

A basis for preparing theses, dissertations, and publications. (Fall)

225 Microbial Physiology I (3) — Reich

Morphology and biochemistry of various microorganisms with emphasis on bacteria. Prerequisite: Bioc 221–22, Micr 211, or equivalent. (Fall)

226 Microbial Physiology II (3) — Reich, DeGiovanni-Donnelly

Effects of physical and chemical agents on microorganisms with emphasis on antibiotics. Prerequisite: Micr 225 or permission of instructor. (Spring)

229 Immunology (3) — Kind, Affronti

Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen-antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor. (Fall)

230 Immunology Laboratory (2) — Kind, Affronti

Serologic and immunologic procedures as applied to clinical and research situations emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Limited to students enrolled in a degree program. Laboratory fee, $20. (Fall, odd years)

231 Immunobiology (1) — Affronti, Kind

Study of immunological functions of reticulo-endothelial tissues, theories of auto-immunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. Prerequisite: Micr 201† or 229, and permission of instructor. (Fall)

* Gerald Eugene Wagner is Assistant Professor of Microbiology in the G.W.U. School of Medicine and Health Sciences.

† For description of Micr 201 see the *School of Medicine and Health Sciences Bulletin*.

233 **Virology** (3) Stokes
Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) Stokes
Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh
History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 21 or equivalent. (Fall, odd years)

251 **Clinical Laboratory Bacteriology** (3) Hugh
For graduate students; open to medical students. Detection and identification of bacterial agents which cause diseases in humans. Comparative isolation and identification methods; emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 212 or equivalent. (Fall, even years)

255 **Clinical Virology** (1) Huang
General principles of virology; emphasis on clinical situations. Prerequisite: Micr 212 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti
Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laboratory fee, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly
Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) Kind
Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) Staff
Required of graduate students. (Academic year)

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MUSEUM STUDIES—GRADUATE PROGRAM

Committee on Museum Studies

J.C. Anderson, A.D. Andrews, R.L. Humphrey, M.P. Lader, B. Mergen, R.K. Packer, C.R. Rose, M.S. Shapiro *(Chairman and Director)*

The Committee serves the Museum Studies Program in an advisory capacity. Its members are drawn from several departments of the University and from the Smithsonian Institution.

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of museum studies. This program provides students with a broad background in museum studies, including a variety of specialized approaches to museum work, with concentrations in museum administration, collections management/conservation, and museum programs.

The Program is designed primarily to prepare students to work with historical and scientific collections. Students whose principal career interests are in art collections and galleries should apply for candidacy in the program for the Master of Arts in the field of art history with a concentration in museum training, offered by the Art Department. Students whose career interests are primarily in curatorial positions with ethnographic and archaeological materials should apply for candidacy for the Master of Arts in the field of anthropology, with a concentration in museum training. Students whose career interests are primarily in curatorial positions with historical materials should apply for candidacy for the Master of Arts in the field of American studies, with a concentration in museum training. Students whose career interests are in museum education should apply for candidacy in the program for the Master of Arts in Teaching—Museum Education, offered by the School of Education and Human Development.

Students applying for candidacy in the Museum Studies Program must meet all general requirements for admission to the Graduate School of Arts and Sciences, including a baccalaureate degree with a major, or its equivalent, in anthropology, art history, American studies, or natural science. In addition, the student should have taken at least six credit hours in each of these fields and at least nine credit hours in one of them, other than the student's undergraduate major, or must show equivalent preparation.

Master of Arts in the field of museum studies—Required: the general requirements, pages 91–99. The degree requires a minimum of 42 hours of course work. At least 15 hours of course work must be in an academic core discipline, for example, American studies, anthropology, biological sciences, geology and paleobiology, public administration, or an appropriate interdisciplinary combination. At least 15 hours of course work must be in museum studies courses in conservation, museum administration, and exhibiting. Six to 12 hours must be in a museum internship in the Washington area or elsewhere. The student must pass a comprehensive examination based on course work and submit a research paper of publishable quality. In addition, the student must fulfill the tool requirement by passing a reading examination in an approved foreign language, an approved course in statistics or computer programming, an approved course in organic chemistry for those specializing in conservation, or other approved courses.

MUSEUM STUDIES

Third Group

201 **Introduction to Museum Studies** (3) Shapiro

An introduction to the field and literature of museum studies. Topics include: types and varieties of museums; governance and organization; financial, human, and physical resources; collections management; conservation principles and practices; programs, exhibition, education; interpretation; research, publications, evaluation; ethics and professionalism.

216 **Collections Management in the Natural History Museum** (3) Collier, Wilcox

General principles of collections management—preservation, storage, maintenance, and documentation of natural science and anthropological specimens. Topics include storage hardware systems, environmental effects on collections, inventory control, registration systems, and data storage and retrieval. (Spring))

233 **Materials and Techniques of Art and Archaeological Artifacts: Inorganic Materials** (3) Zycherman

A non-technical course for archaeologists, anthropologists, and art historians. Nature of the materials of objects of art and archaeology. Physical properties of the raw materials, techniques used to shape them into objects, and the final structure of the objects. (Fall)

234 **Materials and Techniques of Art and Archaeological Artifacts: Organic Materials** (3) Zycherman

A non-technical course for archaeologists, anthropologists, and art historians. Nature of the materials of objects of art and archaeology. Physical properties of the raw organic materials, techniques used to shape them into objects, and the final structure of the objects. (Spring)

265 **The Small Museum: Selected Topics** (3)
(Formerly MStd 255)

Topics will vary. (Fall)

291 **Museum Internship** (3) Shapiro

Individual work experience and/or research experience in museums of the Washington area and possibly elsewhere. Each student should make arrangements with the Director. Museum internships are supervised by one (or more) member(s) of the cooperating museum staff in the area of museum management, conservation, exhibiting, etc. May be repeated for credit. (Fall, spring, summer)

295 **Directed Research** (3) Staff

Individual research on special topics of the museum field. Topics must be approved by the Director of Museum Studies. May be repeated for credit. (Fall, spring, summer)

297 **Special Topics in the Museum Field** (3) Staff

Special topics may be organized by the Museum Studies staff or by request of six or more students.

Related Museum Studies Courses Offered by Other Departments

Conservation:

Art/Anth 292: *Introduction to Conservation*
Art/Anth 293: *Conservation Laboratory Techniques*
Art/Anth 211: *Seminar: Problems in Conservation*
Art/Anth 212: *Advanced Conservation Techniques*
Anth 295: *Research*

Administration:

Art 217–18: *Problems in Museum Work*

Museum Programs:

Art 209–10: *Exhibition and Display Design*
Anth 264: *Seminar: Museum Techniques*
AmCv/Anth 270: *Seminar: Museum Exhibiting*
Anth 291: *Anthropology in the Museum*
Educ 311: *Museum Audiences*

Internships:

Art 201–2: *Museum Projects*
Art 271–72: *Museum Techniques*
Anth 290: *Advanced Museum Research*
AmCv 251: *Museum Research and Education*
Educ 312: *Internship in Museum Education*

MUSIC

Professors G. Steiner *(Chairman)*, R. Parris
Professorial Lecturer E. Meyers
Associate Professor N.A. Tilkens
Assistant Professor R.J. Guenther
Adjunct Assistant Professors M.C. Tolson *(Piano)*, C.J. Pickar (Choral Activities)
Assistant Professorial Lecturer B. Feinstein
Studio Lecturers in Applied Music S.K. Kim *(Piano)*, M. McNabb *(Piano)*, M. Peris *(Piano)*, C.A. Rachlin *(Piano)*, S.H. Prussing *(Voice)*, J.E. White *(Voice)*, R. Parnas *(Violin and Viola)*, R.A. Norris *(Guitar)*, N.M. Irvine *(Bass)*, W.H. Mann *(Flute)*, T.P. Perazzoli *(Flute)*, R.O. White *(Oboe)*, W.R. Wright *(Clarinet and Saxophone)*, L. Lipnick *(Bassoon)*, R. Odmark *(French Horn)*, D. Rorick *(Trumpet)*, B.R. Seidman *(Harp)*, M.C. Sislen *(Guitar)*, A. Lee *(Voice)*, P. Gieseler *(Voice)*, E.M. Guenther *(Organ and Piano)*, P.P. Fischer *(Flute)*, R.J. Blatt *(Cello)*, R.J. Pallansch *(Tuba)*, D. Dalton *(Voice)*, M. Garst *(Piano)*, C. King *(Recorder)*, T. Wardlow *(Percussion)*

Bachelor of Arts *with a major in music (departmental)*—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite courses—Mus 2, 5–6, six hours of applied music lessons, a minimum of four semesters in music ensemble groups.

3. Required courses in related areas—12 hours of one foreign language (French, German, or Italian recommended).

4. Required courses in the major—Mus 101, 102, 103, 104, 131–32, 138, 151; six additional hours of applied music courses. Students preparing for graduate study or professional concentration in music may elect a further program of specialization in music literature, theory, or applied music. (Music theory majors must meet departmental requirements for proficiency in piano; applied music majors must perform a complete public recital or the equivalent in major solo performances.)

Bachelor of Music—Admission to the Bachelor of Music degree program requires demonstration of special advanced pre-admission training and aptitude. The 129-credit-hour program requires a minimum of 72 hours of music courses, as follows: Mus 2 and 9, 5–6, 101–2, 103–4, 131–32, 138, 151, 199; 6 hours of ensemble courses; 12 hours of other applied music courses; and 15 hours of additional music courses according to concentration. The general requirements include a minimum of 51 hours of non-music courses, including 6 hours each of English composition, humanities, social science, and natural science courses, and 12 hours of a foreign language.

Master of Arts in the field of musicology—Prerequisite: a bachelor's degree with a major in music, or an equivalent degree. Applicants from other institutions must present scores on the Advanced Music Test of the Graduate Record Examinations.

Required: the general requirements, pages 91–99. The program of study consists of 30 semester hours of course work including a thesis (six semester hours).

Master of Music in the field of music theory, music composition, conducting, or applied music—Prerequisite: a bachelor's degree with a major in music or an equivalent degree. Applicants from other institutions must present scores on the Advanced Music Test of the Graduate Record Examinations.

Required: the general requirements, pages 91–99. The required second- and third-group course work is as follows:

1. *In the field of music theory*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques.

2. *In the field of music composition*—Thirty semester hours of course work including a creative thesis of one composition in large form properly prepared for performance (chamber music, a symphonic form, or a choral work with orchestral accompaniment) including a theoretical, formal, and harmonic analysis of the work.

3. *In the field of conducting*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques. The requirements also include acceptable public conducting performances.

4. *In the field of applied music*—Thirty semester hours distributed as follows: (a) 12 semester hours of applied music in the area of concentration; (b) 12 semester hours of music theory and music history and literature courses; and (c) a thesis (six semester hours). The thesis consists of a public recital and performance before a designated committee (such a recital and performance must be representative of an extensive and well-rounded repertory, performed on a professionally accepted artistic level), and delivery of an historical and analytical lecture on the musical content of the program; demonstrated leadership in an ensemble performance (opera or oratorio for voice); and a written report on some approved theoretical area related to the student's concentration.

Bachelor of Arts in Education and Human Development with a teaching field in music—Prerequisite: the education curriculum, pages 114–15.
Required: the music option and professional courses listed on page 119.

MUSIC THEORY, HISTORY, AND LITERATURE

First Group

1 Elements of Music Theory (3) Guenther
Notation, scales, keys, intervals, terms, rhythms, and chord structure. (Fall and spring)

2 Ear-Training I (3) Pickar
Melodic and harmonic dictation, ear-training, sight-singing, elementary keyboard harmony. (Spring)

3 Introduction to Musical Understanding (3) Steiner, Guenther
Introductory history of musical styles, related to listening; study of music materials and media. (Fall and spring)

4 Survey of Music Literature (3) Steiner
Introductory study of musical forms, structures, and textures; aural analysis of selected literature. (Spring)

5–6 Harmony (3–3) Parris
Triads, inversions; chord analysis, construction, and progression; part-writing, modulations, altered chords. Prerequisite: Mus 1 or satisfactory passing of placement examination. (Fall and spring)

7 Music of Nonwestern Cultures (3) Tilkens
Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa. (Spring)

8 History of Jazz (3) Staff
Introduction to the styles, composers, and performers of jazz music from its origins to the present. (Summer)

9 Ear-Training II (3) Staff

Second Group

101–2 History of Music I (3–3) Tilkens
Development of music in the Western world from the early Christian era through the Baroque. (Academic year)

103–4 History of Music II (3–3) Tilkens
Development of Western music from the Classic period to the present. (Academic year)

109 Orchestra Literature (3) Steiner
Survey of the history and styles of orchestra literature, analysis of representative works.

110 Chamber Music Literature (3) Steiner
Survey of the history and styles of chamber music literature, analysis of representative works.

121 **The Opera** (3) Feinstein
Survey of the history and styles of opera, analysis of representative works. (Fall)

125 **Keyboard Music Literature** (3) Tilkens
Survey of the history, style, and major content of the keyboard literature from the 16th century to the present.

131–32 **Advanced Theory** (3–3) Parris
Practice in 18th-century contrapuntal writing and analysis, chorale preludes, inventions, and fugues. Prerequisite: Mus 5–6 or equivalent. (Academic year)

133–34 **Composition** (3–3) Parris
(Academic year)

135 **Counterpoint** (3) Parris
Study and practice of 16th-century contrapuntal techniques. (Fall)

137 **Orchestration** (3) Parris
Instrumental scoring. (Spring)

138 **Form and Analysis** (3) Parris
Analysis of musical forms in representative musical literature. (Fall)

151 **Conducting** (3) Steiner
Technique of conducting, score reading, rehearsal procedures, analysis, and interpretation of selected musical literature; practice in conducting. (Fall)

160–61 **Electronic Music** (3–3) Meyers
Tape and electronic techniques, synthesizer use, and acoustical principles. (Academic year)

173 **Pedagogy** (3) Steiner
Principles, materials, and methods of teaching in a selected area. See *Schedule of Classes* for specific area.

199 **Independent Research** (3) Staff
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)

Third Group

203 **Bibliography and Research Methodology** (3) Guenther
(Fall)

205 **Music of the Baroque Period** (3) Tilkens
Study of the musical styles, techniques, and literature from 1600 to 1750.

206 **Music of the Classic Period** (3) Guenther
Study of styles, techniques, and literature from the 18th-century schools through Haydn, Mozart, and Beethoven. (Spring)

207 **Music of the Romantic Period** (3) Guenther
Study of the musical styles, backgrounds, and literature from Schubert through the 19th century.

208 **Music of the 20th Century** (3) Steiner
The principal schools, techniques, developments, and trends of the 20th century. (Spring)

231–32 **Composition** (3–3) Parris
May be repeated for credit. (Academic year)

234 **Seminar: Performance Practices in Selected Areas** (3) Tilkens
Spring: Baroque keyboard practices.

237 **Seminar: Analytical Studies in Music Theory** (3) Guenther, Parris
(Fall and spring)

238 **Seminar: Analytical Studies in Music History** (3) Tilkens, Guenther
Fall: Brahms; spring: Mahler.

239 **Independent Research** (3) Staff

251–52 **Advanced Conducting** (3–3) Steiner
(Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

APPLIED MUSIC

All applied music courses are offered both fall and spring, and may be repeated for credit.

Mus 51, 52, 53, 54, 55 and 153 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, $75.
2. Two- or three-semester-hour courses: individual lessons of one hour a week, supplementary fee, $150.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Supplementary fees are different for courses offered during the summer sessions. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors.

First Group

Required practice: three hours a week for one-semester-hour courses and six hours a week for two-semester-hour courses.

11 **Piano** (1)
12 **Piano** (2) Staff
13 **Voice** (1)
14 **Voice** (2) Staff

15 **Organ** (1) — E. Guenther
16 **Organ** (2)
17 **Violin** (1) — Steiner, Parnas
18 **Violin** (2)
19 **Classical Guitar** (1) — Staff
20 **Classical Guitar** (2)
21 **Viola** (1) — Parnas
22 **Viola** (2)
23 **Cello** (1) — Blatt
24 **Cello** (2)
25 **Bass** (1) — Irvine
26 **Bass** (2)
27 **Flute** (1) — Staff
28 **Flute** (2)
29 **Recorder** (1) — King
30 **Recorder** (2)
31 **Oboe** (1) — R. White
32 **Oboe** (2)
33 **Clarinet** (1) — Wright
34 **Clarinet** (2)
35 **Saxophone** (1) — Wright
36 **Saxophone** (2)
37 **Bassoon** (1) — Lipnick
38 **Bassoon** (2)
39 **French Horn** (1) — Odmark
40 **French Horn** (2)
41 **Trumpet** (1) — Rorick
42 **Trumpet** (2)
43 **Trombone** (1) — R. Guenther
44 **Trombone** (2)
45 **Percussion** (1) — Wardlow
46 **Percussion** (2)
47 **Harp** (1) — Seidman
48 **Harp** (2)
49 **Tuba** (1) — Pallansch
50 **Tuba** (2)

51 **Orchestra** (1) — Steiner
Preparation and performance of orchestral literature. Prerequisite: audition before director. (Fall and spring)

52 **Instrumental Ensemble** (1) — Steiner
Chamber ensemble groups approved by audition. (Fall and spring)

53 **Chorus** (1) — Pickar
Preparation and performance of choral literature. Prerequisite: audition before director. (Fall and spring)

54 **Chamber Choir** (1) — Pickar
Small vocal groups and chorus participation. Prerequisite: audition before director. (Fall and spring)

55 **Band** (1) — Wright
Concert band, stage band and brass ensemble. (Fall and spring)

Second Group

Departmental prerequisite: audition to meet departmental requirements.
Required practice: six hours a week for one-semester-hour courses and 12 hours a week for three-semester-hour courses. In addition, three-semester-hour courses include master performance classes and recital preparation.

111 Piano (1) Staff
112 Piano (3)
113 Voice (1) Staff
114 Voice (3)
115 Organ (1) Staff
116 Organ (3)
117 Orchestral Instrument (1) Staff
118 Orchestral Instrument (3)
119 Classical Guitar (1) Staff
120 Classical Guitar (3)

153 **Opera Workshop** (1) Staff
Preparation and dramatic performance of operatic literature. Prerequisite: audition before director. (Fall and spring)

Third Group

All courses include supervised ensemble preparation and required concert solo performances.

211 Piano (3)
213 Voice (3)
215 Organ (3)
217 Orchestral Instrument (3)

NEW COURSES IN GENERAL AND INTERDISCIPLINARY STUDIES—700 SERIES

Two sets of course numbers have been designated to identify new courses sponsored by this program in Columbian College, the School of Education and Human Development, the School of Government and Business Administration, and the National Law Center:

701 (General Studies)
721 (Interdisciplinary Studies)

In each case, the course title is completed by a brief description of the topic of the individual course. The 701 and 721 courses change frequently; interested students should consult the *Schedule of Classes* for the current semester. The courses are listed with the other offerings of participating departments; course descriptions appear in the center insert for the 700 series.

The 701 number designates courses taught by individual faculty members. They explore topics not normally included in departmental offerings, or utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 721 number designates upper-level courses in which faculty from two or more departments investigate a topic of mutual academic interest. The program is coordinated through the Division of Experimental Programs.

PATHOLOGY—GRADUATE PROGRAM

Professors H. Sidransky *(Chairman)*, F.N. Miller, S. Bloom

Associate Professors S.G. Kent, B.C. Zook *(Comparative)*, Y. Al-Doory, C.T. Garrett
Assistant Professor J.M. Orenstein

Programs of study leading to the degree of *Associate in Science (Medical Laboratory Technique)* are described in the *School of Medicine and Health Sciences Bulletin*.

Doctor of Philosophy in the field of pathology—Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.D.S.). In exceptional cases, applicants with other backgrounds in the life sciences may be accepted.

Required: the general requirements, pages 91–94, 99–101, including 48 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 283, may be counted for a maximum of 24 semester hours of graduate course work. Other experience must satisfy the eligibility requirements of the appropriate national certifying body, i.e., the American Board of Pathology in the case of the M.D., the American College of Veterinary Pathologists in the case of the D.V.M., and the American Board of Oral Pathology in the case of the D.D.S.

Research fields: comparative pathology, human pathology, ophthalmic pathology, veterinary pathology, biochemical pathology, cardiovascular pathology, and nutritional deficiency pathology.

Third Group

Staff

203–4 Pathology (4–4)

General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

Zook

205 Comparative Pathology I (3)

Joint offering of the Departments of Pathology and Biological Sciences. An introduction to the study of disease in vertebrates, comparison with disease in man. Mechanisms by which various agents provoke illness; body defensive reactions. Illustration of common diseases of various species, including material from captive wild animals. Recommended: courses in anatomy, histology, and physiology.

Zook, Montali*

210 Comparative Pathology Laboratory (2)

Participation in an autopsy service involving captive wild animals and comparison of diseases in various animal species with those in man. Open to limited number of graduate students, with permission. (Fall)

Kent

215 Perinatal Pathology Laboratory (2)

Special assignments for dissection and study. Open to limited number of graduate students, with permission. (Fall)

Al-Doory

220 Medical Mycology (2 or 4)

Study of pathogenic fungi, mycotic diseases and their clinical aspects. (Fall)

* Richard Montali is Assistant Clinical Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

221 **Medical Mycology Laboratory** (1) Al-Doory
Laboratory complement to Path 220. Prerequisite or concurrent registration: Path 220. Laboratory fee, $20. (Fall)

222 **Opportunistic Mycoses** (2) Al-Doory
Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

272–73 **Seminars in Mycology** (1–1) Al-Doory
Conferences and discussions on current topics and latest developments in medical mycology. May be repeated for credit, (Academic year)

275 **Research in Mycology** (2 to 4) Al-Doory
Participation in experimental studies in mycotic diseases. Research in laboratory medicine on topics related to medical mycology. May be repeated for credit. (Fall and spring)

276 **Seminar in Experimental Pathology** (1) Staff
Presentations on current topics in experimental pathology. (Fall and spring)

283 **Anatomic Pathology Clerkship** (arr.) Staff
Necropsy and surgical pathology service. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.

295 **Comparative Pathology II** (arr.) Zook, Montali
Participation in veterinary pathology service, including wild and domestic animals. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHARMACOLOGY

Professors H.G. Mandel *(Chairman)*, V.H. Cohn, P. Mazel, S.E. Fabro (Research), J.A. Straw, P. Klubes
Professorial Lecturers J. Axelrod, E. Costa
Associate Professors F.P. Abramson, R.J. Anderson
Assistant Professors B.L. Bean, N.A. Brown

Master of Science in the field of pharmacology—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Phys 1, 2; Chem 11–12, 22, 151–52, 153–54. One year of calculus and a course in physical chemistry are also recommended.

Required: the general requirements, pages 91–99, including Bioc 221–22, Phyl 201, 212; Phar 203, 205, 299–300.

Doctor of Philosophy in the field of pharmacology—Required: the general requirements, pages 91–94, 99–101.

Research fields: biochemical pharmacology, cancer chemotherapy, developmental pharmacology and toxicology, endocrine pharmacology, molecular pharmacology, neuropharmacology, neurotoxicology, cardiovascular pharmacology, pharmacokinetics, pharmacology of drug abuse, and physiological disposition of drugs.

Second Group

114 Drugs and the Consumer (3) Cohn and Staff

General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hayfever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus tradename drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites. Limited enrollment. (Fall)

115 Nonmedical Use of Licit and Illicit Drugs (3) Cohn

Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites. (Spring)

158 Drugs and Their Actions (2) Klubes and Staff

Introductory pharmacology course. Drugs, the basis of their therapeutic and toxic actions and their fate in the body. Admission by permission of the instructor.

Third Group

203 Fundamental Principles of Pharmacology and Toxicology (3) Cohn and Staff

Basic principles of pharmacology, including drug receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, drug toxicity. Admission by permission of the instructor. (Fall)

205 Pharmacology (8) Cohn and Staff

Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

207 **Cardiovascular Pharmacology** (2) Bean and Staff

Physiology and pharmacology of cardiovascular diseases, hypertension, heart failure, coronary artery disease, arrhythmia. Mechanism of action of drugs used in the treatment of cardiovascular diseases. Prerequisite: Phyl 201 and Phar 201, 203, or 205.

215 **Adolescent Drug Abuse** (3) Cohn and Staff

Offered off campus through the College of General Studies. Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

220 **Molecular Events in Toxic Actions** (2) Brown and Staff

Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)

222 **Genetic Toxicology** (2) Williams and Staff

The action of chemicals and radiation in the induction of DNA damage and repair *in vitro* and *in vivo*, and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221–22. (Fall)

224 **Developmental Toxicology** (2) Brown

The effects of exogenous agents on the processes of reproduction and development and their mechanisms of action. Toxic effects on the gametes, embryo, fetus, and neonate. Prerequisite or concurrent registration: Phar 203, 205. (Fall)

226 **Neurotoxicology** (2) Anderson

Mechanisms by which chemicals produce toxic effects on nervous tissue at the subcellular, systemic, and behavioral levels. Effects of chronic and acute exposure. Prerequisite or concurrent registration: Phar 203, 205. (Spring)

230 **Special Topics in Toxicology** (arr.) Staff

Selected aspects of toxicology. Content differs each time the course is offered. May be repeated for credit. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Straw and Staff

Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

256 **Molecular Pharmacology** (2 or 3) Mandel and Staff

Current theory on drug actions, especially chemotherapeutic agents, at molecular level. Effect of drugs on biosynthetic processes of the cell with respect to DNA, messenger RNA, transfer RNA, ribosomes, protein, cell wall, and intermediary metabolites. Factors which alter action of drugs, such as drug interactions and resistance. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff

Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

259 **Cancer Chemotherapy** (2) Klubes and Staff
Selected readings and discussion of recent advances in cancer chemotherapy research. Prerequisite: Phar 201–2 or 205. (Spring, odd years)

260 **Endocrine Pharmacology** (1) Hertz and Staff
Lectures and seminars on recent advances in the pharmacology and mechanisms of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (arr.) Staff
Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff
Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn
Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, excretion of drugs; physical, chemical, and biological factors affecting these processes. Prerequisite: Phar 205 or permission of the instructor. (Spring, even years)

273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff
A description of compartmental and physiological models of drug disposition. Problem-solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology and Toxicology I-II** (1–1) Anderson and Staff
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology and Toxicology III-IV** (1–1) Anderson and Staff
Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) Staff
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Anderson and Staff
Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring, odd years)

295 **Reading and Research** (arr.) Staff
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHILOSOPHY

Professors T.Z. Lavine, R.H. Schlagel *(Chairman)*
Associate Professors W.B. Griffith, R.S. French
Assistant Professors R.P. Churchill, J.D. Moreno

Bachelor of Arts with a major in philosophy (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Required courses in related areas—six semester hours of literature courses selected from Chinese, Classics, English, French, German, Italian, Slavic, or Spanish (Clas 71, 72, or Engl 191–92 recommended); six hours selected from art history, music history, or religion; six hours in history (Hist 39–40 recommended).
3. Required courses in the major—a minimum of 30 semester hours, including Phil 111, 112, 113; 6 semester hours selected from Phil 121, 151, 152; 6 semester hours selected from Phil 131, 132, 162: 6 semester hours selected from Phil 172, 192, 193; plus one additional course recommended to be selected from the graduate seminars in philosophy.

For students expecting to continue in graduate school, it is recommended that they include in their program of study 12 semester hours of introductory French, German, or Greek language courses.

Minor in philosophy—Required: a minimum of 18 semester hours, including 6 hours selected from Phil 111, 112, 113 without Phil 50, or 3 hours selected from the same group of courses with Phil 50, plus 12 hours of elective philosophy courses.

Master of Arts in Special Studies with an area of concentration in philosophy and social policy—An interdisciplinary program which brings the normative, historical, and analytical-logical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements, pages 91–99. Two options are available at the discretion of the faculty: (1) a minimum of 24 semester hours of approved graduate course work plus the successful completion of a thesis, or (2) a minimum of 36 semester hours of graduate course work which does not include a thesis. All students are required to take four courses selected from the following: Phil 198, 231, 242, 271, 272. Phil 205 is open to all students; it is re-

quired of those with insufficient background in philosophy, as determined b the department. Phil 299–300 is required for students electing to write a thesi The remainder of the course work in both options must include a majority o approved courses in the arts and sciences. Other courses may be selected fro the School of Education and Human Development, School of Government an Business Administration, and School of Public and International Affairs. Eac candidate must pass a Master's Comprehensive Examination based on the par ticular interdisciplinary composition of the student's program of study. Prospec tive candidates should consult Professor Roderick French, director of the pro gram.

First Group

41 Roots of the Western Tradition (3) Staf

Same as Clas/Engl/Hist/Rel 41. Basic ideas of western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. To be taken in conjunction with Engl 13. (Spring)

45 Introduction to Logic (3) Churchill

Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Spring)

50 Introduction to Philosophy (3) Staf

Readings from major philosophers and study of philosophic positions from Plato to Sartre. (Fall and spring)

71 Philosophy and Literature (3) Lavine

Philosophical foundations of psychoanalytical psychiatry, existentialism, and Marxism and their expression in literature, e.g., in the works of Mann, Kafka, Camus, Sartre, Hesse, Gide, and Koestler. (Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

111 History of Ancient Philosophy (3) Churchill

History of Western philosophy from early Greece to the early Middle ages. (Fall)

112 History of Modern Philosophy (3) Churchill

History of Western philosophy of the 17th and 18th centuries (Descartes to Kant). (Spring)

113 19th-Century Philosophy (3) Lavine

European philosophy from the Enlightenment and Kant to German Romanticism, Fichte, Hegel, Kierkegaard, Schopenhauer, and Nietzsche. (Fall)

* An interdepartmental course offered by the Philosophy, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion Departments.

121 **Symbolic Logic** (3) Griffith

Systematic study of the principles of valid inference with attention to the development of skill in logical analysis and evaluation of arguments, and to the elementary theory of formal systems. (Fall)

127 **Theories of History** (3) Lavine

Joint offering of the Philosophy and History Departments. Major philosophies of history: Judeo-Christian, linear progressive, historicist, Hegelian-Marxian dialectical, cyclical (Vico, Spengler, Toynbee), and social-scientific (Comte, Weber). Contemporary problems of historical knowledge. (Fall)

131 **Ethics** (3) Griffith

Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Spring)

132 **Social Philosophy** (3) Lavine

Social philosophies from Locke to contemporary theorists. (Spring)

133 **Philosophy, Nonviolence, and the Problem of War** (3) Churchill

Problems of war in relation to morality; theories of human aggression and violence; nonviolence and pacificism as alternatives to war; doctrine of just war. (Summer)

142 **Philosophy of Law** (3) Churchill

Systematic examination of fundamental concepts of law and jurisprudence; special emphasis on the relationship between law and morality. (Fall)

151 **Myth, Science, and the Modern Mind** (3) Schlagel

An overview of the growth of scientific rationalism from its origin in mythopoetic thought to the present, with emphasis on conceptual and methodological developments. Comparison of the cosmological frameworks of Aristotle, Newton, and contemporary physics. (Fall)

152 **Knowledge, Truth, and Reality** (3) Schlagel

Inquiry into the basis and structure of knowledge, the problem of perception and independent reality, the role of language in knowledge, and the meaning and criteria of truth. (Spring)

162 **Aesthetics** (3) Moreno

Nature of aesthetic experience as related to artistic appreciation, criticism, and creation; artistic representation as a kind of systematic symbolization. (Spring)

172 **American Philosophy** (3) Moreno

Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Fall)

192 **Contemporary Philosophy: Analytical** (3) Moreno

The two dominant movements of recent Anglo-American philosophy, logical positivism and British ordinary language philosophy, as represented by Russell, G. E. Moore, Wittgenstein, Ryle, Ayer, etc. (Fall)

193 **Contemporary Philosophy: Phenomenological** (3) Griffith
Turn-of-the-century intellectual crisis and Husserl's phenomenological movement; the phenomenological existentialism of Heidegger and Sartre; existential Marxism in Sartre and Merleau-Ponty; Hermeneutics of Ricoeur and Gadamer. (Spring)

197 **Contemporary Ideologies and Utopias** (3) Lavine
A philosophic analysis of recent ideologies and utopias in Europe, the United States, and Asia: the sociological, psychological, political and intellectual origins of ideologies; their theoretical structure and their practical functions; the relation of ideologies to social change; the significance of the diffusion of ideologies to other cultures; ideologies and the problem of value-relativity. (Fall)

198 **Philosophy of the Social Sciences** (3) Lavine
Philosophic issues relating to theory, methodology, and application of the social sciences. Analysis of one major contemporary social scientific project. (Spring)

199 **Readings and Research** (3) Staff
(Fall and spring)

Third Group

201–2 **Readings and Research** (3–3) Staff
Advanced readings and reports. Investigation of special problems. (Academic year)

205 **Selected Schools and Problems** (3) Staff
An advanced review of the rise of modern empiricism, idealism, and pragmatism, with particular attention to controversies regarding problems of method, epistemology, and social and political theory. Recommended for graduate students who have majored in fields other than philosophy. (Fall)

216 **Seminar: Kant** (3) Schlagel
Critique of Pure Reason.

221 **Seminar: Logic of Social Choice** (3) Griffith
Formal analysis of contrasting arguments justifying social choices: the appeal to welfare optimization, or to fairness of the social decision procedure. Special focus on Arrow's Impossibility Theorem. (Spring)

231 **Ethics and Economic Policy: Justice and Equality** (3) Griffith
Economic policy viewed from the perspectives of ethical and economic theories with special focus upon the issue of income distribution in the United States. (Fall)

235 **Ethics and Business** (3) Griffith
Business practice in the light of ethical theory: corporate power and citizenship, advertising approaches, competitive practices, white collar crime. Cases and incidents. (Spring)

242 **Philosophy, Law, and Social Reform** (3) Churchill
A philosophical investigation of moral and legal rights in the American tradition, the importance of claims of right and entitlement in

policy issues, and the ways legal institutions define specific rights by limiting or giving effect to our duties and liberties. (Spring)

251 **Seminar: Philosophy of Science** (3) Schlagel

Selected topics. (Fall)

252 **Seminar: Epistemology** (3) Schlagel

Critical examination of selected problems or theories of knowledge. (Spring)

271 **Mankind and Nature in Public Policy** (3) French

Relation of philosophical conceptions of man and nature to national policies of growth and development in selected periods of American history. (Fall)

272 **American Philosophy and Mental Health Policy** (3) Moreno

(Formerly Pragmatic Naturalism and American Social Policy)

Analysis and application of philosophical modalities to conceptual problems in mental health care as related to the construction of a social policy. (Spring)

299–300 **Thesis Research** (3–3) Staff

PHYSICAL SCIENCE

See **Chemistry.**

PHYSICS

Professors H.H. Hobbs, J. Eisenstein, O. Bergmann, A.J. Zuchelli, F. Prats (Chairman)
Adjunct Professor L.C. Maximon
Associate Professors W.C. Parke, N.K. Khatcheressian, D.R. Lehman, M.F. Taragin, E.P. Harper
Assistant Professor J.R. Peverley
Assistant Professorial Lecturers M.T. Shams, R. Eaton III, W.D. Lee
Lecturers J.T. Broach, M. Lutzky

Bachelor of Arts or Bachelor of Science with a major in physics (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Phys 3, 14, 15, 16; Chem 11–12; Math 31, 32, 33.
3. Required course in related area—Stat 97 or EE 51.
4. Required courses in the major—Phys 151, 161, 162, 163, 164, 165–66, 167, 168.

Minor in physics—Required: Phys 3, 14, 15, 16; Phys 163 and 164 or approved substitutes from 100-level physics courses.

Master of Arts in the field of physics—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.
1. The Master's degree program *with* thesis—Required: the general requirements, pages 91–99, and 30 semester hours of course work in physics, including Phys 211, 212, 213–14, 221–22, 233, 299–300; plus one of the following: Phys 224, 225–26, 231, 243, 244.
2. The Master's degree program *without* thesis—Required: the general requirements, pages 91–99, and 36 semester hours of course work in physics and

mathematics including Phys 211, 212, 213–14, 221–22, 233; plus one of the following: Phys 224, 225–26, 231, 243, 244.

A reading knowledge of a foreign language, or the successful completion of Stat 197, with a grade of *A* or *B* is a tool requirement.

Doctor of Philosophy in the field of physics—Required: the general requirements, pages 91–94, 99–101, and the successful completion of one of the two following tool requirement options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of Stat 197 with a grade of *A* or *B*.

Research field: nuclear physics: theoretical studies on the structure, electromagnetic interactions and scattering of few-body systems at low and intermediate energies.

Bachelor of Arts in Education and Human Development with a teaching field in physics—Prerequisite: the education curriculum, pages 114–15.
Required: the physics option and the professional courses listed on page 119.

Departmental Prerequisite: Phys 3, 14, 15, 16; two semesters of calculus or equivalent; and consent of a departmental advisor are prerequisite to all second-group courses.
Undergraduate departmental advisors: W. Parke, N. Khatcheressian, M. Taragin
Graduate departmental advisors: D. Lehman, F. Prats

ASTRONOMY

First Group

9–10 Introduction to Astronomy (3–3) Hobbs
Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $15 per semester. (Academic year)

11–12 Introduction to Astronomy (2–2) Hobbs
Same as Phys 9–10 without the laboratory. (Academic year)

21 Modern Cosmology (3) Staff
Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12.

PHYSICS

First Group

1 Foundations of Physics (4) Parke, Peverley
Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $20.

2 Introduction to Modern Physics (4) Zuchelli, Eisenstein

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave-particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $20.

3 Foundations of Physics (3) Parke, Peverley

Same as Phys 1 without laboratory. This course may not be taken by students who have completed, or are enrolled in or plan to enroll in Phys 1.

4 Introduction to Modern Physics (3) Zuchelli, Eisenstein

Same as Phys 2 without laboratory. This course may not be taken by students who have completed, or are enrolled in or plan to enroll in Phys 2.

6 Energy and the Environment (3) Lehman

Consideration of energy resources and their utilizational impact on the environment from a physical viewpoint. Topics include: the demand for energy, the cost of energy, nuclear fission-radiation hazard to humans, pollution due to energy sources, transportation of energy and waste, and energy converters. Prerequisite: high school algebra.

14 Introductory Mechanics and Thermal Physics (3) Khatcheressian

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent; Math 31. Laboratory fee, $20.

15 Elements of Electricity and Magnetism (3) Taragin, Peverley

Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss' Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent; Math 31. Laboratory fee, $20.

16 Introduction to Modern Physics (3) Lehman

Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Topics include wave-particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $20.

27–28 Physics in Medicine (3–3) Parke

Principles of physics applied to biological systems and to medical instrumentation, including ultrasonics, circulation dynamics, bioenergetics, optics in medicine, applications of IR and UV radiation, medical transducers, particle radiation in medicine, models of the brain, molecular biophysics. Prerequisite: Phys 2 or equivalent.

Second Group

151 Intermediate Laboratory (3) Taragin, Khatcheressian
Independent advanced work to introduce students to research techniques and use of specialized instruments. Laboratory fee, $15. (Fall and spring)

161 Mechanics I (3) Prats
Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Euler's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's equations.

162 Mechanics II (3) Bergmann
Basic aspect of continua, including elasticity and fluid dynamics, strain tensor, stress tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

163 Physical and Quantum Optics (3) Eisenstein, Hobbs
Oscillations and waves, energy and momentum of the electromagnetic field, interference, diffraction, geometrical optics, optics of crystals and other media, dispersion.

164 Thermodynamics (3) Taragin, Parke
Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.

165–66 Electromagnetic Theory (3–3) Zuchelli
Development of Maxwell's field equations using vector and tensor calculus, electrostatics, stationary and nonstationary phenomena, basic circuit theory, electronmagnetic waves and radiation.

167 Principles of Quantum Physics (3) Harper
Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization; careful consideration of the laboratory results to which the theory is a response.

168 Applied Quantum Physics (3) Harper
Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. Prerequisite: Phys 167 or equivalent.

170 Elementary Solid State Physics (3) Khatcheressian, Eisenstein
Structure of solids, lattices and lattice defects, deformation, vibrational and electronic contribution to specific heats, binding energies, electronic states in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and normal mode expansions are developed as needed.

175 Nuclear Physics (3) Lehman, Prats
Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell

model, the liquid-drop model, beta-decay, fission, and fusion. Prerequisite: Phys 167 or permission of instructor.

195 **Undergraduate Research** (3) Staff
Research on problems approved by the staff. Admission by permission of the staff member concerned. May be repeated once for credit.

Third Group

Consent of a departmental graduate advisor is required for admission to all third-group courses in physics.

211 **Advanced Mechanics** (3) Bergmann
(Formerly Phys 232)
Analytic methods of mechanics as a basis for modern theory: variational principles, Lagrange's equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.

212 **Special Relativity** (3) Bergmann
(Formerly Phys 235)
Application of relativistic concepts to the basic fields of physics: space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.

213 **Electromagnetic Theory: Macroscopic Effects** (3) Eisenstein
(Formerly Phys 231)
Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, induced polarizations, time-dependent fields, frame dependence of the fields, gauge transformations, radiation fields.

214 **Electromagnetic Theory: Electrodynamics and Radiative Effects** (3) Bergmann, Eisenstein
(Formerly Phys 236)
Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where suitable. Specific topics include radiation by moving charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.

221–22 **Quantum Mechanics** (3–3) Prats
(Formerly Phys 233–34)
General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations and transformation theory. Schrödinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)

224 **Statistical Mechanics** (3) Lehman, Bergmann
(Formerly Phys 241)
Study of classical and quantum equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining principles of statistical mechanics. Among topics considered: distri-

bution functions, H-theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.

Staff

225–26 **Laboratory** (3–3)
(Formerly Phys 251–52)
Individual work on special topics. Laboratory fee, $20 per semester. (Academic year)

231 **Quantum Electrodynamics: Theory and Applications** (3) Zuchelli
(Formerly Phys 245)
A presentation of the lower order effects depending upon the quantal nature of the electromagnetic field: Hamiltonian formulation and field quantization, perturbation calculations, Compton effect, photoelectric effect, electron-electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.

232 **Quantum Field Theory** (3) Bergmann
(Formerly Phys 246)
Covariant presentation of general theory of quantized fields, Boson and Fermion fields, theory of S-matrix, dispersion relations, and renormalization program.

233 **Nuclear Theory** (3) Prats, Lehman, Harper
(Formerly Phys 247)
Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics and weak interactions.

243 **Solid State Physics: Structure and Binding** (3) Khatcheressian, Hobbs, Taragin
Atomic structure of solids and analysis of the binding of crystals. Crystalline forms and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.

244 **Solid State Physics: Electronic Processes in Metals** (3) Khatcheressian, Eisenstein
Phenomena in metals and semi-conductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.

250 **Selected Topics in Modern Physics** (3) Staff
Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; electric states and superconductivity; gauge field theories; dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate advisor. (Fall and spring)

291 **Seminar** (1) Staff
Lectures on special problems in physics. May be repeated once for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHYSIOLOGY—GRADUATE PROGRAMS

Professors C.S. Tidball, R.A. Kenney *(Chairman)*, M.E. Tidball, M.M. Cassidy, M.J. Jackson
Associate Professors R.A. Lavine, D.W. Watkins
Assistant Professor J.K. Kelleher

Master of Science in the field of physiology—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements, pages 91–99. In addition to the thesis, the 30 hours of required work should include Phyl 201, 221, 298, and at least three semester hours of research (Phyl 295).

Doctor of Philosophy in the field of physiology—Required: the general requirements, pages 91–94, 99–101. The program of study includes a major field in physiology, a subfield (see below) in physiology, and a minor field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination should include Bioc 221–22 or Phyl 205; Phyl 201, 221, 298, 396, 397.

Research fields and areas of study: applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology, and respiratory physiology.

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201.

Second Group

191 **Selected Topics in Human Structure and Function** (3) Kenney
Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with the approval of the major advisor. (Fall)

Third Group

201 **Physiology** (8) **Staff**
Lecture (8 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 201, 221–22 (Bioc 222 may be taken concurrently) or Phyl 205; or consent

of chairman of department. Open to Consortium students only with permission of department chairman. (Spring)

205 **Cell Biophysics** (2) Jackson

Lecture (2 hours). An introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. A required course for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in the Columbian College of Arts and Sciences with the approval of the student's major advisor. (Fall)

212 **Neurobiology** (3) Staff

Same as Anat 212. An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, $25. (Spring)

221 **Seminar** (1) Cassidy

Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy

Discussion on principles of fluid and acid-base balance and the application of these principles to scientific situations. (Fall)

260 **Membrane Physiology** (2) Jackson

Weekly lectures or seminar. Systematic review of the factors which determine the movements of water and solutes across simple cellular membranes and complex epithelial barriers in animal tissues. Prerequisite: Phyl 205 or permission of instructor. (Fall)

261 **Gastrointestinal Physiology** (1 or 2) Jackson

Weekly seminar; role of basic sciences in gastroenterology; intra- and extra-mural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey, at an advanced level, of aspects of cardiovascular physiology especially as interrelated with the respiratory and renal systems. (Fall)

268 **Muscle Contraction: Physiological and Biochemical Aspects** (2) Walker, Frank

Joint offering of the Biochemistry and Physiology Departments. Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction. Prerequisite: an introductory course in biochemistry and physiology, or permission of the department.

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball
Lecture one hour a week, practical experience at student's convenience. Orientation to processing analog and digital signals on mini-computers. Programming in assembly language as well as a high-level language of the student's choice. No previous computer experience necessary. (Fall)

271 **Computer Simulation of Physiological Processes** (3) C. Tidball
Lecture 1 hour a week; practical experience at student's convenience. Programming of physiological simulation will be learned by writing a series of simulations of increasing complexity. Prerequisite: Phyl 270 or equivalent or permission of instructor.

272 **Reading and Research in Simulation of Physiological Processes** (3) C. Tidball
Readings in physiological simulations and their evaluation. Informal discussions at regular intervals. Prerequisite: Phyl 271 or equivalent or permission of instructor. May be repeated once for credit.

295 **Research** (arr.) Staff
By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of credit. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (arr.) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

396 **Advanced Reading and Research** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of Physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in Physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

POLISH

See **Slavic Languages and Literatures.**

POLITICAL SCIENCE

Professors R.E. Purcell, H.L. LeBlanc, B. Nimer, A. Gyorgy, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., B. Reich *(Chairman)*, Y.C. Kim, S.J. Wayne, J.M. Logsdon
Associate Professors C.F. Elliott, C.A. Linden, H.R. Nau, D. Klingman
Assistant Professors S. Shaffer, C. McClintock, M.J. Sodaro, S.L. Wolchik, J.R. Henig, D.E. Pollock *(Visiting)*, C.J. Deering, S.S. Smith, S.J. Carroll, S.R. Lichter, R.D. McDevitt *(Visiting)*

Bachelor of Arts with a major in political science (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite: PSc 1 and 2. Six courses in the social sciences, other than political science, to include six hours of history or six hours of economics. Twelve semester hours of introductory foreign language and statistics are strongly recommended.

3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement which consists of six semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 104, 105, 106, 107, 108, 109, 110. Group B (American government and politics)—PSc 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 124. Group C (comparative government and politics)—PSc 130, 131, 146, 165, 168, 170, 173, 177, 179, 180, 181, 183. Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 161, 178, 182, 184.

Of the courses in Group A at least one must be PSc 101, 102, or 104, and it is recommended that this course be taken as early in the student's academic program as possible.

Every major must complete a proseminar (PSc 192) or, if eligible, an Honors Seminar (PSc 196, 197, 198, or 199) in the junior or senior year. A maximum of two of these may be included in a student's program; such courses do not satisfy the department's group distribution requirements. A 200-level course may be substituted for the proseminar requirement with the permission of the instructor and the undergraduate coordinator. Completion of, or concurrent enrollment in, a methodology course (PSc 101, 102, or 104) is a prerequisite to the proseminars or 200-level courses.

The Department also offers a major with a public policy focus. Students who wish to concentrate in public policy must distribute their 30 hours in political science as follows: 3 semester hours from each of Groups A, B, C, D; PSc 104; 9 semester hours in policy-oriented courses to be selected from a group designated by the program advisor; and one policy-oriented proseminar.

Up to 12 hours of either service-learning or internship credit may be applied towards a degree. No more than six hours of such courses may be credited toward the major; these courses do not satisfy the distribution requirement.

Students in the 90-semester-hour degree program (see page 83) must receive grades of *A* in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, the student must fulfill the general requirements (see pages 50–51) and take at least one political science honors seminar in which an independent study project is completed with distinction. The project is reviewed by a Departmental Honors Committee. To be eligible for enrollment in an honors seminar, students must be political science majors, have successfully completed PSc 101, and have achieved a QPI in the major of at least 3.5 as juniors or at least 3.3 as seniors. PSc 101 may *not* be taken concurrently with the honors seminar.

Minor in political science—Required: 15 semester hours of second-group political science courses, plus 9 hours of other social science courses. At least 3 hours must be taken in each of the groups listed under the requirements for a B.A. in the field of political science, item 3.

Master of Arts in the field of political science—Prerequisite: a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required: The general requirements, pages 91–99, and either a reading knowledge of a modern foreign language or a specified level of knowledge in statistics, or two graduate-level courses in a cognate discipline. Students may elect one of the following programs: (1) 24 semester hours of graduate course work, plus a thesis (equivalent to six semester hours), and the satisfactory completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate course work without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields selected from those listed under the Ph.D. program.

All students must take one course chosen from PSc 200, 230, or 240 during the first semester of graduate study. The course selected must have the approval of the coordinator of graduate studies.

Doctor of Philosophy in the field of political science—Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences.

Required: The general requirements, pages 91–94, 99–101. Each student must complete a General Examination, which covers a major and minor field of study. PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from four principal subject-matter divisions. Each subject-matter division has several subfields of study from which the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist-Leninist thought, and scope and methods of political science); (2) comparative and foreign politics (comparative political analysis, regional comparative politics, and domestic politics of a specified major political system); (3) international relations (international politics, international law, international organization, regional international relations, and foreign relations of a specified major political system); and (4) American politics (American political process, national policy-making process, American constitutional law and judicial process, science policy, and state, local, and urban politics). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

Departmental prerequisite: PSc 1 and 2 (or their equivalent) are prerequisite to all second-group courses in political science.

First Group

1 **Introduction to Comparative and International Politics** (3) Gyorgy, Sodaro

Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies. (Fall and spring)

2 **Introduction to American Politics and Government** (3) Purcell, LeBlanc, Wayne, Morgan

Structure, powers, and processes of the American political system. (Fall and spring)

3 **Introduction to Political Behavior** (3) Lichter

Study of political behavior, including the role of politics in today's world, the sources of elite and mass political behavior, and the influence and nature of political institutions. May be taken only with joint registration in Hum 3. (Fall)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Scope and Methods of Political Science** (3) Kim, Shaffer, Carroll, Smith

Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)

102 **Empirical Political Analysis** (3) Shaffer, Smith

Extensive examination of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)

104 **Methods of Public Policy Analysis** (3) Henig, Carroll, Klingman

Models and case studies of public policy formation and changes, techniques of policy analysis and evaluation, normative implications of alternative policy-making frameworks. (Spring)

105 **Political Theory: Major Issues of Western Political Thought I** (3) Linden (Fall

Foundations of Western political thought—Plato to Aquinas. (Fall and spring)

106 **Political Theory: Major Issues of Western Political Thought II** (3) Linden

Theoretical roots of modern political order and disorder—Machiavelli to Rousseau. (Fall and spring)

107 **Issues in Modern Political Thought** (3) Linden, Wolchik

Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Fall)

108 **Modern Communist Ideologies** (3) Elliott

Intensive study of theories and philosophical assumptions of modern communism. Emphasis on the careers and ideas of leading figures: Marx, Engels, Lenin, Stalin, Khrushchev, and Mao. (Spring)

* An interdepartmental course offered by the Political Science, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Religion Departments.

109 Democratic Theory (3) Staff
Issues of recent democratic thought and theory, particularly in relation to the contemporary American political process. (Fall)

110 American Political Thought (3) Morgan
Political thought in the U. S. from colonial times to the present as seen through major representative writings. (Spring)

111 State and Urban Politics (3) Henig
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall)

112 State and Urban Policy Problems (3) Henig
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings. (Spring)

113 Policy and Politics of Intergovernmental Relations (3) Staff
Analysis of relationships among national, state, and local governments. Emphasis on the policy consequences of intergovernmental relations and the emerging federal system. (Fall)

114 U.S. Constitutional Law and Politics I (3) Morgan
Separation of powers, federal-state relationships, economic regulation. (Fall)

115 U.S. Constitutional Law and Politics II (3) Morgan
Political and civil rights. (Spring)

116 The American Presidency (3) Wayne
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance. (Fall and spring)

117 Public Administration and Bureaucratic Politics (3) Staff
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Spring)

118 Legislative Process (3) Deering, Smith
Theory, structure, and process of the U.S. Congress, with emphasis on elections, party organization, committees, and floor procedure, in the context of executive-legislative relations and interest-group activities. (Fall and spring)

119 U. S. Political Parties and Politics (3) LeBlanc
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches. (Fall and spring)

120 Public Opinion and Political Socialization (3) Carroll
Sources of mass political attitudes and behavior; voting and political campaigning. (Fall)

122 Science, Technology, and Politics (3) Logsdon
Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology. (Fall and spring)

124 **Issues in Domestic Public Policy** (3) Henig, Deering
Examination of the decision-making process and the substance of various issues in domestic public policy in such areas as crime, economics, education, energy, the environment, poverty, and health. (Fall and spring)

129 **TV News: The Politics of Visibility** (3) Lichter
Joint offering of the Departments of Journalism, Political Science, and Speech and Drama. Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. (Fall and spring)

130 **Comparative Government and Politics I** (3) Kim, McClintock, Peterson
Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring)

131 **Comparative Government and Politics II** (3) Gyorgy, Hinton, Elliott, Sodaro, Wolchik
Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring)

140 **International Politics** (3) Nau, Shaffer
International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring)

142 **International Organizations** (3) Nau, Stambuk
Development and operations of the United Nations, regional organizations, and functional international organizations. (Fall and spring)

144 **Public International Law** (3) Staff
Survey of international law; emphasis on development and trends. (Fall and spring)

146 **U. S. Foreign Policy** (3) Purcell
Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy. (Fall and spring)

149 **Military Force and Foreign Policy** (3) Sapin, Lewis
Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Fall)

161 **European-Atlantic Relations** (3) Stambuk
International politics of the North Atlantic area, the European Common Market, and U.S.-European relations. (Fall)

165 **Government and Politics in Eastern Europe** (3) Gyorgy
Study of the contemporary social and ethnic structures, governmental systems, and international position of the Eastern European states within the Soviet system. (Summer)

168 **Soviet Foreign Policy** (3) Elliott
Relations with U. S., Europe, Third World, China; international com-

munism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)

170 **Governments and Politics of China and Japan** (3) Hinton
Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts. (Fall, odd years)

173 **Governments and Politics of South and Southeast Asia** (3) Hinton
Interaction of traditional, colonial, and contemporary influences in the domestic and international politics of the Indian subcontinent and of mainland and insular southeast Asia. (Fall, even years)

177 **Governments and Politics of the Middle East** (3) Reich, Pollock
Politics of the eastern Arab states, Turkey, Iran, Israel. (Fall)

178 **International Relations of the Middle East** (3) Reich, Pollock
Analysis of the regional and international relations of the Middle East. (Spring)

179 **Israeli Foreign Policy** (3) Reich
Examination of the institutions, processes, and issues of Israeli foreign policy. (Fall)

180 **Governments and Politics of North Africa** (3) Reich, Lewis
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East. (Spring)

181 **Politics of Middle and Southern Africa** (3) Nimer
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)

182 **African International Politics** (3) Nimer
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181 or equivalent. (Spring)

183 **Governments and Politics of Latin America** (3) McClintock
Political processes and institutions in Latin America, particularly Mexico, Chile, Peru, Brazil, and Cuba. Emphasis on issues of reform and revolution. (Fall)

184 **International Relations of Latin America** (3) McClintock
U. S.-Latin American relations, inter-American diplomacy and organization, foreign policies of selected states. (Spring)

*187 **Internship: Political Behavior** (3) Deering
Study of political behavior through internship experience with Congress, executive departments or agencies, politically active private-sector groups, political parties, or electoral campaigns. May be repeated for credit with approval. (Fall and spring)

*188 **Internship: Urban Affairs** (3 or 6) Henig
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. (Fall and spring)

* Admission requires departmental approval.

*189 **Internship: Legal Process** (6) Love
The legal system and its role in promoting social change. Readings, group discussions, and work with lawyers and third-year law students. (Fall and spring)

190 **Selected Topics in Political Science** (3) Staff
(Fall and spring)

*191 **Selected Topics: International Affairs** (3 or 6) Staff
Examination of selected problems in international relations. (Fall and spring)

*192 **Proseminar: Political Science** (3) Staff
Examination of selected problems in political science. (Fall and spring)

*193 **Proseminar: Urban Affairs** (3 or 6) Henig
Readings, research, and class discussion on selected topics in urban politics and policy-making. Primarily for senior urban affairs majors. (Fall and spring)

*196 **Honors Seminar: Political Theory** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*197 **Honors Seminar: American Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*198 **Honors Seminar: Comparative Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*199 **Honors Seminar: International Politics** (3)
Research on selected topics. Prerequisite: PSc 101.

Third Group

200 **Scope and Methods of Political Science** (3) Linden, Shaffer, Carroll, Smith
Introduction to the discipline and profession, analysis and comparison of some approaches to political inquiry, and empirical research design. (Fall and spring)

201 **Empirical Political Analysis** (3) Shaffer, Carroll, Smith
Techniques of social science data analysis. Emphasis on using computers for statistical analysis in political research. No previous experience with statistics or computers required. (Fall)

202 **Advanced Topics in Empirical Political Analysis** (3) Shaffer, Smith
Advanced techniques of data collection and analysis; varying emphasis on such methods as causal modeling, analysis of variance, regression analysis, and simulation. (Spring)

203 **Public Policy Analysis** (3) Henig, Carroll, Klingman
Reading and research on systematic methods of public policy analysis. (Spring)

* Admission requires departmental approval.

205 **Readings in Political Theory** (3) Linden
Selected major works, both ancient and modern, which illuminate basic problems and questions of political theory. (Fall)

206 **Topics in Political Theory** (3) Linden
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring)

207 **Readings in Socialism and Communism** (3) Elliott, Linden, Wolchik
Readings and discussions of works illuminating the development of pre- and post-Marxian socialist thought. (Fall)

208 **Readings in Marxism-Leninism** (3) Elliott, Linden
Readings and discussions in Marxism-Leninism and its controversies from Lenin to the present. (Spring)

209 **Democratic Theory** (3) Staff
Readings and discussions in democratic theory. Attention to recent work toward formulation of adequate theory in American political science. (Fall or spring)

210 **American Political Thought** (3) Staff
Readings and discussions. Analysis and evaluation of major intellectual sources of American political thought.

211 **State and Urban Politics** (3) Henig
(Formerly State Politics)
Comparative analysis of the context, institutions, processes, and policies of state and urban political systems.

212 **State and Urban Policy Problems** (3) Henig
(Formerly Urban Politics)
Analysis of public policy issues confronting state and urban governments; emphasis on the theoretical roots and empirical impact of past and present programs in such areas as housing, education, poverty, and crime.

213 **Intergovernmental Relations** (3) Staff
Analysis of the fiscal, structural, social, and political aspects of the evolving federal system; emphasis on metropolitan government. (Fall)

214 **Topics in Constitutional Law** (3) Morgan
Lectures and group discussions on constitutional law and politics. (Fall, even years)

215 **Judicial Policy-making** (3) Morgan
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues. (Fall, odd years)

216 **American Presidency** (3) Wayne
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making. (Fall)

217 **Bureaucratic Politics** (3) Staff
Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy. (Spring)

218 **Legislative Theory and Behavior** (3) Deering, Smith
Theory, structure, and process of the U.S. Congress, with emphasis on member-constituency relations, individual and collective decision-making, party and committee activities, executive-legislative relations, and interest-group activities. (Spring)

219 **American Political Parties and Electoral Behavior** (3) LeBlanc
Nature and functions of political parties, with special emphasis on party influences on electoral behavior and congressional decision-making. (Fall)

220 **Public Opinion and Political Socialization** (3) Carroll
Sources and dynamics of public opinion and political socialization. (Spring)

222 **Government, Science, and Technology** (3) Logsdon
National and international policy issues which arise from the interaction between scientific and technological development and governmental activity. (Fall)

223 **Science, Technology, and Public Affairs** (3) Logsdon
Intensive examination of selected public policy issues with significant scientific or technological aspects. Prerequisite: PSc 222 or permission of instructor. (Spring)

230 **Comparative Government and Politics I** (3) Kim, McClintock
Examination of basic approaches to comparative politics. (Fall)

231 **Comparative Government and Politics II** (3) Kim, McClintock
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)

232 **Comparative Communist Systems I** (3) Wolchik
Joint offering of the History and Political Science Departments. Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. (Fall)

233 **Comparative Communist Systems II** (3) Wolchik
Joint offering of the History and Political Science Departments. Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba and non-ruling communist parties. (Spring)

240 **Theories of International Politics I** (3) Nimer, Shaffer
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall)

241 **Theories of International Politics II** (3) Nimer, Shaffer
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring)

242 **Problems in International Organizations I** (3) Nau, Stambuk
Collective security, law, and the politics of international organizations. (Fall)

243 **Problems in International Organizations II** (3) Nau, Stambuk
Social and economic interdependence and the politics of international organizations. (Spring)

244 **International Law I** (3) Staff
Readings in selected areas. (Fall)

245 **International Law II** (3) Staff
Research in selected areas. (Spring)

246 **U. S. Foreign Policy** (3) Purcell
Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution. (Fall)

247 **Public Opinion and Foreign Policy** (3) Purcell
Research and readings on U.S. public opinion interest groups that influence foreign policy. (Spring)

248 **U. S. National Security Policy-making** (3) Sapin
Executive organization and processes for national security policy-making. Attention to relevant theoretical approaches. (Fall)

249 **U. S. National Security Policy** (3) Sapin, Lewis
Fundamental considerations; selected issues, e.g., arms control and disarmament, regional security problems, military assistance. (Spring)

252 **Science, Technology, and World Order** (3) Nau
Intensive reading, discussion, and research on the impact of science and technology on world order, in particular on the claim that a new global politics is replacing traditional or nation-state politics. (Spring)

258 **Communist Party of the Soviet Union** (3) Sodaro
Joint offering of the History and Political Science Departments. Analysis of the internal evolution of the Communist Party and its role in the Soviet system from its origins to the present day. (Spring)

260 **Western European Politics** (3) Staff
Examination of the principal characteristics of the British, French, West German, and Italian political systems, comparing their institutional and behavioral adaptations to the problems of advanced industrial democracies. (Fall)

261 **Politics of the European Community** (3) Stambuk
(Formerly Problems in Transnational and Comparative Politics of Western Europe)
Problems in Western European politics, with emphasis on supranational political processes and selected policy outcomes in the context of the European Common Market. (Spring)

263 **Communism in Non-Communist Europe** (3) Sodaro
Examination of non-ruling European communist parties; relations between these parties and other ruling and non-ruling communist parties.

264 **The International Politics of Eastern Europe** (3) Gyorgy and Staff
Major historical, political, social, and regional factors which have shaped the inter-war, World War II, and post-war evolution of Eastern Europe; emphasis on foreign relations with outside powers and on regional East-West contacts. (Spring)

265 **Governments and Politics of Eastern Europe** (3) Gyorgy and Staff
A comparative study of Eastern European states: political, social, economic institutions; emphasis on domestic conditions and problems of individual Eastern European countries. (Fall)

266 **Readings in Soviet Government and Politics** (3) Elliott, Linden
Readings in contemporary Soviet domestic government and politics. (Fall)

267 **Soviet Government and Politics** (3) Elliott, Linden, Wolchik
Research seminar in selected problems of Soviet domestic government and politics. Emphasis: since Stalin. Prerequisite: PSc 266 or permission of instructor. (Spring)

268 **Soviet Foreign Policy** (3) Elliott
External problems and policies of the USSR, with emphasis on the period since Khrushchev. Relations with other communist states, Western powers, other countries, and non-ruling communist parties. (Spring)

269 **Soviet Military Policy and Strategy** (3) Wolfe, Elliott
Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought. (Fall or spring)

270 **Politics of the People's Republic of China I** (3) Hinton
Introduction to the substance of and literature on contemporary Chinese politics. Discussion and reading. (Fall)

271 **Politics of the People's Republic of China II** (3) Hinton
Research seminar. Introduction to the analysis of official Chinese documents; presentation of student papers. (Spring)

272 **Foreign Policy of the People's Republic of China** (3) Hinton
Objectives; formulation and implementation; the People's Republic of China as Asian state, revolutionary influence, would-be great power. (Spring, even years)

273 **Governments and Politics of South and Southeast Asia** (3) Purcell
Research and selected readings as basis for analysis of structure, problems, and policies of the governments of selected countries; particular reference to India. (Spring)

274 **Southeast Asia in World Politics** (3) Staff
Southeast Asia in great-power perspective. Balance-of-power concept and development of Asian subsystem. (Spring)

275 **International Politics of the Far East** (3) Hinton
Foreign policies and international behavior of the regional states (especially China, Japan, and Vietnam) and the extraregional powers (especially the U.S. and the U.S.S.R.). (Spring, odd years)

276 **Governments and Politics of Japan and Korea** (3) Kim
Readings and research on the domestic and foreign policies of Japan, North and South Korea. (Fall or spring)

277 **Governments and Politics of the Middle East** (3) Reich, Pollock
Readings and research on selected problems of the governments and politics of the Middle East. (Fall)

278 **International Relations of the Middle East** (3) Reich, Pollock
Readings and research on the regional and international relations of the Middle East. (Spring)

280 **Governments and Politics of North Africa** (3) Reich, Lewis
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Spring)

281 **Topics in African Politics** (3) Nimer
Readings, research, and discussion of selected aspects of African domestic and international politics. (Spring)

283 **Governments and Politics of Latin America** (3) McClintock
Readings and discussion on politics in Latin America, particularly Mexico, Chile, Peru, Brazil, and Cuba. Emphasis on issues of reform and revolution. (Fall)

284 **International Relations of Latin America** (3) McClintock
Readings and discussion on U.S.-Latin American relations and the foreign policies of selected states. (Spring)

285 **Problems in Latin American Civilization** (3) Staff
Same as Anth/Econ/Geog/Hist/Rom 287. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

286 **Selected Topics in American Politics** (3) Staff
Readings and discussion. (Fall or spring)

287 **Selected Topics in Political Theory** (3) Staff
Readings and discussion. (Fall or spring)

288 **Selected Topics in Comparative Politics** (3) Staff
Readings and discussion. (Fall or spring)

289 **Selected Topics in International Politics** (3) Staff
Readings and discussion. (Fall or spring)

290 **Colloquium: Middle East** (3) Reich
Interuniversity colloquium for advanced students of Middle East affairs. Admission by permission of the instructor. (Fall and spring)

291 **Colloquium: East Asia** (3) Hinton
Interuniversity colloquium for advanced students of Far Eastern affairs. Admission by permission of the instructor. (Fall and spring)

292 **Colloquium: Russia and Eastern Europe** (3) Gyorgy
Interuniversity colloquium for advanced students of Russian and Eastern European affairs. Admission by permission of the instructor. (Fall and spring)

297 **Reading** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

298 **Research** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

Fourth Group

301 **Advanced Reading and Research in Political Theory** (3) Staff

310 **Advanced Reading and Research in American Politics** (3) Staff

340 **Advanced Reading and Research in Comparative Politics** (3) Staff

350 **Advanced Reading and Research in International Politics** (3) Staff

397 **Advanced Reading** (3) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

398 **Advanced Research** (3) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (3) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PORTUGUESE

See **Romance Languages and Literatures.**

PSYCHOLOGY

Professors T. Hunt *(Emeritus)*, E.L. Phillips, J.N. Mosél, B.I. Levy, W.E. Caldwell, R.D. Walk *(Chairman)*, R.K. White *(Emeritus)*, A.D. Kirsch, E. Johnson *(Emeritus)*, V. Kirkbride *(Emeritus)*, C.E. Rice, E. Abravanel, D.E. Silber, J. Miller, C.J. Lange, A.J. Caron *(Research)*, F.L. Schmidt *(Research)*
Adjunct Professor R.F. Caron
Professorial Lecturers R.K. Kahn, S.L. Cohen
Associate Professors C.E. Tuthill, R.H. Tanck *(Research)*, S.A. Karp, R.W. Holmstrom, L.A. Rothblat, P.J. Poppen, L. Brandt, S.K. Green
Adjunct Associate Professor D.G. Kleiman
Associate Professorial Lecturer E.C. Stewart
Assistant Professors A.R. Bruhn, S. Hashtroudi

Clinical Training Staff

Clinical Professor J. Borriello
Associate Clinical Professors I.M. Zimmerman, J.W. Cummings, M.E. Zedek, E. Blum, P.D. Daen, D.A. Evans

Bachelor of Arts with a major in psychology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite courses—seven or eight semester hours selected from Psyc 1, 5 and 6.

3. Required courses in related areas:

(a) three semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 6. (Students expecting to do graduate study in psychology should elect Stat 53.)

(b) 9 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 113, 151 recommended), political science or sociology, of which six hours must be from one of the following: anthropology, economics, history, political science or sociology. If a student takes more than six hours in any one department, the excess will be credited to electives.

4. Required courses in the major—27 semester hours in second-group psychology courses, including Psyc 196 and one course from each of the following groups—*Group A:* Psyc 118, 121, 161; *Group B:* Psyc 115, 144, 151, 156; *Group C:* Psyc 101, 129, 131; *Group D:* Psyc 110, 112, 132.

It is recommended that students contact their academic advisors as soon as possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplating graduate study are reminded that most graduate schools require knowledge of one and sometimes two foreign languages.

To qualify for graduation with Special Honors the student must fulfill the general requirements (see pages 50–51), take an honors seminar (Psyc 197), and complete an independent study project (Psyc 191) with distinction. The grade point average in psychology required for graduation with Special Honors is 3.3.

Minor in psychology—18 semester hours are required, including Psyc 1 and at least 9 semester hours of second-group psychology courses. Students considering graduate study in psychology are advised to take Psyc 5 or 6, a distribution of courses from categories A, B, C, D above, Psyc 196, and an elementary course in statistics.

Master of Arts in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology at this University, or an equivalent degree. Admission to the program is limited; preference will be given those who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements, pages 91–99. Of the 24 required semester hours (exclusive of the thesis), a minimum of 18 must be in third-group psychology courses including Psyc 202 and either 203 or 204; six may be in related fields approved by the department. For detailed requirements consult the chairman of the department.

Doctor of Philosophy in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Miller Analogies Test and the Aptitude Test of the Graduate Record Examination are required for admission.

Required: the general requirements, pages 91–94, 99–101, including (1) the satisfactory completion of the tool requirement; (2) Psyc 202, 203–4, Stat 105; and (3) the satisfactory completion of a Preliminary Examination and a major Field Examination.

Areas of study: clinical, developmental, experimental, industrial and organizational, and social psychology.

Students electing psychology courses in the freshman year should begin with Psyc 1; with permission of instructor students may elect Psyc 5–6 in the freshman year.

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

First Group

1 General Psychology (3) Staff
Fundamental principles underlying human behavior. (Fall and spring)

5–6 Principles and Methods of Psychology (4–4) Walk, Hashtroudi
Lecture (3 hours), laboratory (3 hours). An experimental approach to understanding behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: memory, human information processing, learning, and motivation. Laboratory fee, $10 per semester. (Academic year)

8 Psychology of Motivation and Personality (3) Tuthill, Bruhn, Karp
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)

22 Introduction to Educational Psychology (3) Kirkbride, Tanck
The contributions of psychology to education; emphasis on learning.

29 Psychology of Childhood (3) Brandt, Bruhn
Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world.

Second Group

101 Abnormal Psychology (3) Silber, Holmstrom, Bruhn
Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. (Fall and spring)

104 Ecology and Mental Health (3) Karp
Examination by field research of the linkages between aspects of the physical environment and mental health. Lectures and student field research projects. (Fall)

105 The Psychology of Consumer Behavior and Attitudes (3) Phillips
Consumer behavior and attitudes in regard to advertising, buying habits, consumer action groups and social pressures, and mass persuasion. Lectures and field work. (Spring)

108 Humanistic Psychology (3) Mosél
Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations, existential and phenomenological psychology, the new mentalism. (Spring)

110 Perception and Understanding in Children (3) Abravanel
Concepts and research in the area of developmental psychology; emphasis on the growth and development of perception, cognition, and language. (Spring)

112 **Psychology of Adolescence** (3) Bruhn, Johnson

Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to solution of such problems. (Fall and spring)

115 **Psychology of Language and Communication** (3) Mosél

Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar theory, cultural and linguistic structures in the perception and learning of language. (Fall and spring)

117 **Psychology of Art and Picture Perception** (3) Walk

Principles of perception as applied to art. Theories of Arnheim, Gibson, Gombrich, and Goodman as related to art and picture perception; study of cross-cultural research and research with children.

118 **Neuropsychology** (3) Rothblat

Analysis of neural processes underlying behavior. Basic structure and functions of the nervous system, with emphasis on sensory processes, learning and memory, motivation, and emotion. (Fall and spring)

119 **Group Dynamics** (3) Miller

Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Enrollment limited. (Spring)

121 **Psychology of Learning** (3) Hashtroudi

Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects. (Fall)

122 **Psychology and Human Relations** (3) Silber

Understanding human relations and T-group techniques by evolving an on-going T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)

129 **Theories of Personality** (3) Karp, Poppen

Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring)

130 **Seminar: Political and Social Implications of Current Approaches to Psychological Treatment** (3) Karp

Discussion and presentation of recent works, such as those of Szasz, Goffman and various writers on minority liberation, bearing upon the implications for individuals and society of various approaches to psychological treatment, including psychotherapy and behavior modification.

131 **Psychological Tests** (3) Hunt, Karp, Holmstrom

Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $10. (Fall and spring)

132 **Socialization in Childhood** (3) Brandt

Examination of primary methods by which the child is shaped in terms of social judgment and self control; internalization of con-

trols, assimilation of societal values and parenting procedures. Organized by focus on issues according to developmental level.

135 Freud and Modern Psychoanalysis (3) Miller

Introduction to the work of Freud and his impact on modern psychoanalysis, focusing on the meaning of dreams and the unconscious function of conflict and defense, infantile sexuality and the Oedipus conflict, development of the ego, theory of anxiety and neurosis, and the death instinct. (Spring)

144 Personnel and Industrial Psychology (3) Cohen, Mosél

Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity. (Fall and spring)

150 Psychology of Sex Differences (3) Poppen

Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 Social Psychology (3) Tuthill, Poppen, Green

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, and racial attitudes. (Fall and spring)

154 Psychology of Criminology (3) Silber

Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior. (Fall)

156 Psychology of Attitudes and Public Opinion (3) Tuthill

Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare.

158 Psychology of Interpersonal Attraction (3) Green

Psychological bases for interpersonal attraction; emphasis on personal variables, relevant theoretical approaches and effects of attraction on other behavior.

161 Comparative Psychology (3) Caldwell

Lectures and demonstrations on animal psychology. Psychological processes in infrahuman organisms, evolution of behavior, the place of animal experimentation and research in psychology. (Spring)

168 Principles and Techniques in Neuropsychological Research (3) Rothblat

Introduction to basic anatomical, physiological and behavioral techniques used in neuropsychological research to explore relationships between the brain and behavior. Admission by permission of instructor. Laboratory fee, $20. (Spring)

170 Clinical Psychology (3) Levy

An exploration of the history, functions, and problems of the clinical psychologist. Assessment, treatment, community approaches, ethics. Prerequisite: Psyc 101, 131. (Spring)

188 **Attitudes toward Death and Dying** (3) Staff
Exploration of the many different aspects, attitudes, and experiences associated with the process of death and dying. Limited to juniors and seniors.

191 **Independent Research in Psychology** (3) Staff
Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit. (Fall and spring)

192 **Field Experience in Psychology** (3) Abravanel
Senior psychology majors will spend a minimum of six hours a week in a local mental health, rehabilitation, school, or community setting. Students registering for this course must have prior approval of the instructor. (Fall and spring)

196 **History and Systems of Psychology** (3) Caldwell, Rice
Senior capstone course which includes a survey and integration of the major viewpoints and concepts of psychology. Required of psychology majors. (Fall and spring)

197 **Honors Seminar in Psychology** (3) Staff
Selected topics in psychology which change from semester to semester. Intended primarily for juniors who plan to enroll in Psyc 191 (independent research) in the senior year. May be repeated for credit.

198 **Current Research Issues in Psychology** (3) Staff
Conducted as a seminar. Recent experiments in psychology, including those performed by members of the class; emphasis on student participation. May be repeated for credit.

Third Group

Third-group courses are limited to graduate students in psychology, except by special permission of instructor.

202 **Psychological Research Methods and Procedures** (3) Abravanel, Holmstrom
Required in all graduate psychology programs. Prerequisite: graduate standing, a laboratory course in psychology, and an elementary course in statistics. (Spring)

203–4 **Experimental Foundations of Psychology** (3–3) Hashtroudi, Rothblat and Staff
Required of doctoral students in psychology during first year of study. Psyc 203: basic issues in learning and motivation. Psyc 204: physiological processes; sensation and perception. (Academic year)

206 **Methods of Clinical and Personality Research** (3) Rice
Review of techniques especially relevant to research in clinical, personality, and social psychology. Scaling methods, multivariate techniques, introduction to the use of computers in data analysis. Prerequisite: Psyc 202; Stat 105 or equivalent. (Spring, odd years)

207–8 **Psychological Assessment** (3–3) Holmstrom, Levy, Silber
Open only to clinical graduate students in the Department of Psy-

chology. Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory—diagnostic work at clinical facilities. Material fee, $10 per semester. (Academic year)

209 **Seminar: Psychology of Motivation** (3) Caldwell

Various theoretical approaches to the psychology of motivation; systematic concepts and experimental findings deriving from each approach. (Spring)

211 **Assessment of Cognitive Functioning** (3) Levy

Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $10. Admission by permission of instructor. (Summer)

212 **Personality Assessment by Projective Techniques** (3) Levy

Methods of personality assessment, primarily the Rorschach. Material fee, $10. Admission by permission of instructor. (Summer)

213–14 **Seminar: Developmental Psychology** (3–3) Abravanel, Brandt, Walk

Psyc 213: research and theory in developmental psychology, emphasis on perceptual and cognitive development; consideration of the development of social awareness and of genetic-biological growth processes. Psyc 214: current research and theory in perceptual, cognitive, and social development; intensive study of selected research problems. (Academic year)

215 **Personality Assessment by Multiple Procedures** (3) Brandt, Bruhn

Consideration and use of a wide range of procedures in assessment of personality and psychopathology of children. Prerequisite: Psyc 207–8 or 211 and 212. Graduate students in fields other than psychology admitted by permission of instructor. Material fee, $7.

216 **Psychological Assessment by Graphic Means** (3) Levy

Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought. Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)

218 **Seminar: Systems of Psychotherapy** (3) Silber

Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. (Summer)

219 **Group Dynamics** (3) Miller

Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Bion, Slater, Miller and Rice. Enrollment limited. (Spring)

220 **Seminar: Abnormal Psychology** (3) Miller

Study of selected problems of psychopathology. (Fall)

221–22 **Seminar: Group Psychotherapy** (3–3) Borriello

For graduate students in the clinical psychology program. Open to others if space permits and with permission of instructor. Psyc 221: survey of group therapy approaches; Psyc 222: supervised experience

with therapeutic groups. Prerequisite to Psyc 221: Psyc 219. (Academic year)

223 **Seminar: Learning** (3) Hashtroudi
Selected topics of current research interest in the psychology of learning. (Spring)

225 **Seminar: Child Psychotherapy** (3) Bruhn
Theory and practice of insight-oriented psychotherapy with children. Class observation of an ongoing treatment case. Supervised treatment of a child in a practicum setting. Permission of instructor required for all students except graduate students in the child clinical track. (Spring)

226 **Seminar: Clinical Psychology of Childhood and Adolescence** (3) Brandt
For graduate students in psychology; open to others with permission of instructor, if space permits. Exploration of major topics concerning psychopathology in children and adolescents; discussion of nosological issues with emphasis on theoretical and research literature.

227–28 **Seminar: Principles of Psychotherapy** (3–3) Kahn
For graduate students in clinical psychology; open to others, with permission of instructor, only if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon. Prerequisite: Psyc 218. (Academic year)

229 **Seminar: Principles of Behavior Change** (3) Phillips
Stimulus-organism-response variables and their interactions, with emphasis on learning theory as applied to clinical problems. (Fall)

231 **Development of Psychometric Instruments** (3) Mosél
Quantitative techniques and principles used in construction, standardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for measurement purposes. Prerequisite: course in tests and measurements and an elementary course in statistics. (Fall)

232 **Ego Psychology and Theories of Object Relations** (3) Holmstrom
Emphasis on theoretical contributions of Freud, Hartmann, Kris, Klein, Rapaport, Kernberg, and others. Assessment and treatment are addressed, primarily with reference to investigations of borderline and characterological disorders. Permission of instructor required for all students except those in clinical psychology. (Spring)

234 **Seminar: Theory of Psychological Measurement** (3) Mosél
Development of classical axiomatic-deductive theory underlying major notions in the construction and evaluation of psychological tests. (Spring)

235 **Seminar: Community Mental Health** (3) Miller
For graduate students in the Department of Psychology; open to others, with permission of instructor, only if space permits. Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health issues. Prerequisite: Psyc 219. (Fall)

240 **Seminar: Selected Topics in Psychopathology** (3) Silber
Examination of current research and theory in psychopathology. (Spring)

241–42 **Family Systems: Theory, Practice, and Research** (3–3) Evans
Family dynamics and their implications for assessment and treatment. Special emphasis on the role of research in the process of evaluation of family systems and family therapy. Enrollment limited to advanced doctoral students in clinical psychology. (Academic year)

243 **Psychoanalytic Theory and Research** (3) Miller
An introduction to classical and modern psychoanalytic theory and research. A review of Freud's central works, focusing on his case studies and their role in theory development. Emphasis on Freud's view of clinical research comparing his works with those found in contemporary studies of dreams, personality development, psychopathology, family dynamics, and related topics.

245 **Seminar: Organizational Behavior** (3) Mosél
Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)

246 **Seminar: Personnel Evaluation Techniques** (3) Mosél, Harper
Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

247 **Seminar: Psychological Tests and Equal Opportunity** (3) Hunt
Technical, professional, practical, and legal demands of psychological test use. Current problems of fairness, discrimination against minorities, and test validation. (Summer) Cohen

248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3)
Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria. (Spring, even years) Mosel

249 **Organizational Behavior Modification** (3)
Application of operant and other behavioristic principles to changing individual and group performance in organizations. Contingency management and organizational development. New approaches to intrinsic job motivation based on covert reinforcement theory. (Spring—alternate years)

251 **Seminar: Advanced Social Psychology** (3) Tuthill, Poppen, Green
Current research and theory: motivation and cognition, dissonance, social interaction theory, interpersonal processes, group dynamics, group conflict. (Fall)

252 **Research Methods in Social Psychology** (3) Tuthill, Poppen, White, Green
Selected methods such as public opinion polling, attitude scaling

interviewing, content analysis, naturalistic observation, field research or laboratory experimentation. May be repeated for credit. (Fall and spring)

254 **Seminar: Experimental Social Psychology** (3) Tuthill

Experimental study of small groups, group climates, interaction process analysis. Lewin's field-theoretical approach to individual and group processes. (Spring, odd years)

257 **Current Topics in Social Psychology** (3) Poppen, Green

Advanced seminar with focus on major theoretical approaches, research, or problem areas within field of social psychology. Topic changes each semester. (Fall and spring)

258 **Seminar: Attitude Change** (3) Tuthill

Review of recent research literature on attitude formation and change. Examination of theories of attitude change and experimental findings. (Spring, even years)

263 **Evaluation Research** (3) Rice

Research issues and methods in evaluating the impact of social intervention and service programs, especially those in mental health. Specification of program goals and effectiveness criteria; measurement problems; experimental and quasi-experimental designs; political problems surrounding evaluation research. (Spring, even years)

268 **Seminar: Neuropsychology** (3) Rothblat

Selected problems in research relating the brain and behavior. Independent topics each semester such as sensory processing, brain development and behavior, clinical aspects of nervous system function.

272 **Seminar: Theories of Personality** (3) Caldwell

Emphasis on theoretical problems and methodology in the field of personality study. (Fall, odd years)

274 **Comparative Psychology and Ethology** (3) Caldwell

Synthesis of the principles and findings of ethology and comparative psychology. Examination of the theories and findings of Lorenz, Tinbergen, and Jakob von Uexküll in the light of recent experimental investigations. (Fall, even years)

281 **Clinical Neuropsychology I** (3) Rothblat

Analysis of experimental and clinical findings from studies attempting to localize and interpret human brain dysfunction, with emphasis on perceptual and cognitive behavior. Topics include overviews of neuroanatomy and neurological techniques, clinical description and theoretical consideration of major neuropsychological disorders, mechanisms underlying recovery of function and potential for rehabilitation. Graduate students in fields other than psychology admitted by permission of the instructor.

282 **Clinical Neuropsychology II** (3) Levy

Examination of important psychological procedures for the assessment of human brain dysfunction. Instruments and batteries such as the Bender-Gestalt, Wechsler Adult Intelligence Scale, Halstead-Reitan Neuropsychological Battery, and Luria's Neuropsychological

Tests. Prerequisite: Psyc 211, 212, 281, and permission of the in
structor.

289 **Seminar: Current Topics in Experimental Psychology** (3) Staf
Review and discussion of contemporary research and theory in
specialized field of psychological study, by leaders in the field. In
dependent topics each semester; may be repeated for credit. (Fal
and spring)

291 **Theories of Organizational Behavior** (3) Coher
Examination of current theoretical models and research. (Spring
odd years)

292 **Seminar: Perception** (3) Walk
Study of current research and theory in the experimental psychology
of perception and perceptual development. (Spring)

295 **Independent Research in Psychology** (3) Staff
Individual library or experimental research under supervision of
staff member. Arrangements must be made with sponsoring faculty
member prior to registration. May be repeated for credit. (Fal
and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy major
field examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for
credit. (Fall and spring)

PSYCHIATRY AND BEHAVIORAL SCIENCES

The following course, offered by the Department of Psychiatry and Behavioral
Sciences in the University's School of Medicine and Health Sciences, is open
to advanced graduate students in clinical psychology. For detailed description,
consult the *School of Medicine and Health Sciences Bulletin*.

365–66 **Seminar: Clinical Introduction to Family Diagnosis and Therapy** (3–3)

PUBLIC ADMINISTRATION—GRADUATE PROGRAMS

Professors D.S. Brown, W. Sommers *(Emeritus)*, S.R. Chitwood, M.S. Barato
(Visiting)
Professorial Lecturers N. Beckman, H.M. West III
Associate Professors M.M. Harmon, B.L. Catron, A.E. Merget, S. Tolchin,
C.W. Washington *(Chairman)*, L.H. Truong
Assistant Professor W.C. Adams

Programs of study in Public Administration leading to the degrees of Master of Public Administration and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 135–64).

Third Group

205 **Introduction to Public Administration and Management** (3) Brown, Harmon, Truong

Provides frame of reference for study of public administration. Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest. Management in the public sector. (Fall and spring)

212 **Legislative Management** (3) Tolchin

Analysis of Congress as a management system; examination of its internal administration and its role in formulating policy through legislation. Executive-legislative relationships, staffing practices, budget processes, leadership, rules and procedures, oversight functions, and the management of foreign policy are examined.

213 **Administration in the Federal Government** (3) Tolchin

Critical analysis of the structure and administration of the federal government from both a managerial and political perspective. Emphasis on executive branch organization, integration, and coordination, as well as current trends in government regulation, accountability, and effectiveness. (Fall and spring)

215 **Law and the Public Administrator** (3) Chitwood

Exploration and analysis of the functions of law in a democratic society. Emphasis is placed upon the procedural, historical and jurisprudential dimensions of American law. This broad perspective seeks to convey understanding of the law as a legal and moral force guiding and constraining public decision making. (Spring)

216 **Federal Government Regulation of Society** (3) Tolchin

Joint offering of the Departments of Public Administration and Business Administration. Analysis of the federal regulatory process as it affects the public and private sector. Specific problems involving presidential management, systemic failures, dejudicializing the regulatory process, policy conflicts, reform efforts, legislative oversight, and economic deregulation. Emphasis is placed on new solutions. (Spring)

217 **Seminar: Development Administration I** (3) Truong

The nature of underdevelopment. Specific problems of less developed countries. National cultures and political and administrative systems. The giving of assistance: types of foreign aid; problems of working with aid givers. (Fall)

218 **Seminar: Development Administration II** (3) Truong, Brown

Problem of the transfer of administrative capability from one country to another. Political and administrative development. Unilateral and multilateral approaches. The role of the innovator. Strategies of administrative development. (Spring)

221 **Organization Theory and the Public Sector** (3) Catron, Harmon, Washington

Analysis of organization theory with special focus on public organi-

zations; current issues in organization theory; decision-making, the organizational environment and the changing nature of organizations in a post-industrial society. (Fall and spring)

223 **Behavioral Factors in Large and Complex Organizations** (3) Brown
Analysis of the nature and characteristics of large organizations. Bureaucracies and their behavioral patterns; dysfunctionalism. Approaches to policy guidance and leadership, particularly in large public organizations; influence and control systems. Future trends. (Fall and spring)

224 **Managerial Leadership in Complex Organizations** (3) Brown
What the manager must know and do to provide leadership and guidance in large, complex public organizations. Subjects explored include program planning and the supervision and direction of staff so as to achieve organizational objectives.

231 **Public Personnel Administration** (3) Truong
Basic principles, legislative and judicial background, and currently significant practices in personnel administration in the public service. Roles of recruitment, selection, wage and salary administration, employee development, and other personnel functions. (Fall)

232 **Problems in Public Personnel Management** (3) Sommers, Truong
Analysis of major personnel management problems in government: labor-management relations, affirmative action for equal employment opportunity, impact of legislation and court decisions on trends in personnel policies, and other continuing problems. (Fall and spring)

233 **Seminar: Manpower Development and Utilization** (3) West
Examination of public and private manpower trends, problems, policies, and programs. Exploration of approaches, old and new, to the administration of manpower programs. Analysis of impact of economic, political, and social factors on manpower.

235 **Seminar: Technology Change and Professional Human Resource Planning** (3) Frame, Roman
Addresses human resource problems arising from automation and other technological changes. Evaluation of these developments in government, business, and educational organizations, and their implications for productivity, employment, training, and education. Analysis of economic, political, and social factors influencing public and private human resource policies. (Spring)

236 **Labor-Management Relations in the Public Sector** (3) Staff
Principles and current issues in public sector labor relations; collective bargaining and the merit concept, scope of bargaining, representation elections, unfair practices, grievance procedures, bilateralism and the management process.

242 **Administration of State and Local Governments** (3) Washington
Examination of state and local governmental structures and functions, their place within the federal system, their revenue sources, their limitations, and the alternatives available to encourage more effective administration to meet public and private demands. (Fall and spring)

245 **Intergovernmental Relations** (3) Beckman, Washington

Assessment of the impacts and consequences of changes in the administration of intergovernmental policies and programs in the federal system. Legislation, roles and responsibilities of federal, state, regional and local systems will be examined from both theoretical and practical vantage points.

246 **Dynamics of Citizen Participation in Administration** (3) Taylor, Merget

Review of the basic theory and principles of democracy in the American system of governance. Analysis of the nature of participation in a pluralistic society, including the characteristics and dynamics of citizen-based organizations. Exploration of effective methods or models by which citizens may contribute to administration. (Summer)

248 **Financing Local Government** (3) Merget

Analysis of the theory and practice of public finance in local governments. Includes the financing of services through municipal taxation, intergovernmental funds, debt instruments, and other revenue sources. (Fall and spring)

249 **Urban Public Policy** (3) Washington

Examination of selected national policies and their effects on urban areas and governments. Emphasis on policy dimensions of urban systems and their relationship to the social, political, and economic context. Against the background of urban politics and administration, areas of health, education, welfare, manpower, transportation, and housing will be addressed. (Spring)

251 **Governmental Budgeting** (3) Staff

Survey of the basic concepts, principles and practices in governmental budgeting; interrelationship of planning, programming, and budgeting; their role in the management process. (Fall and spring)

252 **Public Expenditure Analysis and Planning** (3) Merget

Intensive analysis of the concepts and principles of economics as applied to the public sector and the analytic techniques used by government agencies for planning, allocating, and managing scarce resources in the implementation of public programs. Topics discussed include benefit-cost analysis, program budgeting, productivity, and performance measurement. (Fall and spring)

253 **Public Financial Management Within Federal Agencies** (3) Staff

Intensive analysis of the concepts, principles, and general practices of financial management within federal departments and agencies, focusing on the interrelationships of financial and program functions and drawing on the several financial disciplines of budgeting, accounting, and auditing. (Spring)

260 **Policy Formulation and Administration** (3) Harmon, Tolchin

Normative and analytical models of the policy process; effects of decision-making and institutional arrangements on public policy formulation and implementation. (Fall and spring)

261 **Policy Analysis in Public Administration** (3) Baratz, Catron

Concepts and issues in public policy analysis. Theoretical problems encountered in policy analysis. The role and limits of analytic tech-

niques in the development, implementation, and evaluation of public policy. (Fall and spring)

262 **Seminar: Science, Technology, and Public Policy** (3) Black

The impact of science and technology upon public administration in terms of both administrative practice and national policies. (Spring)

264 **Public Program Evaluation** (3) Catron

Theory and practice of program evaluation and evaluative research. Exploration of scope and limitations of current practice in evaluation, considering economic, political, social, and administrative factors. Examination of methodological considerations for design, data collection, analysis, and dissemination. (Spring)

267 **Cases in Public Policy** (3) Baratz, Catron

Critical analysis of topical issues in public policy, using a case-study approach. Specific issues covered will vary. Designed principally for MPA students in the last half of their program. Prerequisite: PAd 260 or 261, 295, or permission of instructor. (Fall)

288 **Field Problem Studies in Public Administration** (3) Staff

Field research and approved internships on selected issues and aspects of public administration, including specific policy and management problems arising in governmental agencies and related public institutions. Open to Masters students upon completion of 9 hours toward the degree program and with the consent of the intern coordinator. (Fall and spring)

289 **Public Program Management and Policy Implementation** (3) Staff

A review of the diverse concepts and methods in public administration; an analysis and integration of the salient political, economic, managerial, and leadership values and issues in implementing public policies. Open only to MPA degree candidates in their final semester of study; serves as a capstone seminar to the MPA program. (Fall and spring)

290 **Special Topics in Public Administration** (3) Staff

Experimental course offering; new course topics and teaching methods. May be repeated once for credit.

295 **Research Methods** (3) Adams

Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. (Fall and spring)

296 **Statistical Applications in Public Administration** (3) Adams

Use of statistics and computers in research and program evaluation. Development of basic statistical competency; frequency distributions, sampling, central tendency, variability, correlation, probability, regression; computer assistance. Prerequisite: PAd 295. (Fall and spring)

298 **Directed Readings and Research in Public Administration** (3) Staff

Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit.

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy and methodology in public administration.

300 **Thesis Research** (3) Staff

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to other graduate students at the discretion of the department or the instructor.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

323 **Seminar: The Large and Complex Organization** (3) Brown
Unique problems of large, complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.

373 **Seminar: Public Administration and American Political and Social Institutions** (3) Merget, Washington
Supervised in-depth study of contemporary literature in selected fields and of research methodology in public administration.

374 **Seminar: Trends in Public Administration Theory** (3) Harmon
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behavioralism, humanism, existentialism and phenomenology.

377 **Seminar: Social Action and Public Policy** (3) Catron
Interdisciplinary approach to foundations of public policy with focus on theoretical problems of social action. Interrelation of theory and practice. Decision and management as human actions.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Public Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Public Administration candidates. May be repeated for credit.

PUBLIC AND INTERNATIONAL AFFAIRS

Programs of study in Chinese language and literature, East Asian studies (China or Japan), international affairs, Middle Eastern studies, public affairs, and urban affairs leading to the degree of Bachelor of Arts, and programs of study in East Asian studies, international affairs, Latin American studies, Middle Eastern studies, public affairs, Russian and East European studies, security policy studies, and science, technology, and public policy leading to the degree of Master of Arts are offered by the School of Public and International Affairs (see pages 164–82).

RADIOLOGICAL SCIENCES

Committee on Radiological Sciences

W.C. Eckelman *(Chairman)*, V.H. Cohn, J.B. Levy, R.C. Reba, S.O. Schiff

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of radiological sciences. The program is directed by a committee whose members are drawn from the Departments of Radiology, Pharmacology, Chemistry, and Biological Sciences.

Applicants should have a baccalaureate degree in chemistry, physics, pharmacy, or the biological sciences. Graduate Record Examinations are required for Ph.D. degree applicants and recommended for M.S. applicants. The undergraduate program must have included two semesters each of organic chemistry, physical chemistry, and general biology, and one semester of quantitative analysis.

Master of Science in the field of radiological sciences—Required: the general requirements, pages 91–99. The 40 semester hours required for this program must include: Rad 190; Bioc 221–22; Phyl 191; Stat 127; RSci 201, 220, 221, 230, 240, and 241; Phar 203; and six hours of RSci 299–300.

Doctor of Philosophy in the field of radiological sciences—Required: the general requirements, pages 91–94, 99–101. The program of study must include: Rad 190; Bioc 221–22; Phyl 191; Stat 127; RSci 201, 220, 221, 230, 240, 241, and 250; Chem 235 and 236; and Phar 203. The tool requirements may be met by the satisfactory completion of an approved course in statistics other than Stat 127 and one foreign language or a course in computer programming.

RADIOLOGICAL SCIENCES

201 Nuclear- and Radio-chemistry (3)

An introduction to the structure of matter and radioactive decay. Covers concepts of radioactive decay and growth, interaction of radiation with matter, radiation detection and measurement, statistical considerations, tracers in chemical applications, radioactive decay processes, and nuclear models.

220 Radiopharmaceuticals (3)

An introduction to the chemistry and mechanism of action of radiolabeled tracers used in clinical nuclear medicine including the chemistry of technetium, indium, and the halogens and radiopharmaceuticals for specific organs and organ systems such as lung, bone, bone marrow, heart, kidney, and liver.

221 Preparation of Radiopharmaceuticals (1)

A laboratory course taught in conjunction with RSci 220, involving the preparation of radiopharmaceutical kits used in clinical nuclear medicine.

230 Radioimmunoassay (2)

A review of the current methods used in radioreceptor assay and radioimmunoassay. Topics covered include iodination, antisera preparation, separation of bound from free antigen solid-phase antibody systems, methods involving labeled antibodies, extraction and concentration of hormones from physiological fluids, and mathematical treatment of data and automation.

240 **Chromatographic Techniques and Quality Assurance** (3)
An introduction to separation sciences with emphasis on separation equilibria, diffusion and mass transport, operational aspects of separation, chromatography, characteristics of individual separation methods, distillation, gas-liquid chromatography, solvent extraction, liquid-liquid chromatography, crystallization, ion-exchange separation processes, and liquid-solid adsorption chromatography.

241 **Laboratory: Chromatographic Techniques and Quality Assurance** (1)
Laboratory to accompany RSci 240.

250 **Seminar in Radiopharmaceutical Chemistry** (1)
Invited lectures by research groups in radiopharmaceutical chemistry.

299–300 **Thesis Research** (3–3)
(Fall and spring)

399 **Dissertation Research** (arr.)
May be repeated for credit.

CHEMISTRY

221 *Advanced Analytical Chemistry I* (3)
222 *Advanced Analytical Chemistry II* (2 or 3)
233 *Organometallic Chemistry* (3)
235–36 *Advanced Inorganic Chemistry* (3–3)
251–52 *Advanced Organic Chemistry* (3–3)
257 *Physical-Organic Chemistry* (3)
258 *Synthesis and Structure Determination in Organic Chemistry* (3)

PHYSIOLOGY

191 *Selected Topics in Human Structure and Function* (3)
201 *Physiology* (8)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology and Toxicology* (3)
256 *Molecular Pharmacology* (2 or 3)
258 *Cancer Chemotherapy* (1)
260 *Endocrine Pharmacology* (1)
269 *Pharmacology Seminar* (1)
275–76 *Advanced Topics in Pharmacology I-II* (1–1)
277–78 *Advanced Topics in Pharmacology III-IV* (1–1)

BIOLOGY

167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)

BIOCHEMISTRY

221–22 *General Biochemistry* (3–4)

STATISTICS

127 *Statistics for the Biological Sciences* (3)

RELIGION

Professors R.G. Jones, H.E. Yeide, Jr. *(Chairman)*, D.D. Wallace, Jr., A.J. Hiltebeitel
Associate Professorial Lecturer E.S. Jospe
Assistant Professors S.A. Quitslund, D.A. Altshuler

Bachelor of Arts with a major in religion (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken to satisfy the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—six hours from among Rel 9, 10, 59, 60.
3. Four required courses in related areas—(a) six semester hours in studies of cultures other than American and English (preferably a foreign language), and (b) six semester hours in either literature, philosophy, or history.
4. Required courses in the major—thirty semester hours including at least twenty-one hours of upper-level courses. Twelve of these hours must be chosen from one of the following religious traditions: Judaism (Rel 103, 107, 113, 114, 115, 116, 174, 184), Christianity (Rel 104, 105, 122, 124, 143, 144, 145, 146, 172), religions of India (Rel 157, 158, 159, 160, 162). Appropriate graduate seminars may be approved as substitutions for advanced-level courses. The program must include Rel 101 and at least one course in each of the following areas: Hebrew Scriptures, New Testament, Eastern religions, Western religions.

An honors thesis course (Rel 191) is available for eligible students.

It is recommended that students include the study of foreign languages in their undergraduate program, including Hebrew for those specializing in Judaism and biblical studies, Greek for those specializing in early Christianity (including the New Testament), Sanskrit for those specializing in the religions of India. All students expecting to enter graduate school are urged to study French or German.

Minor in religion—Required: a minimum of 18 semester hours in religion, of which at least 6 must be upper-level courses. The minor program will be developed in consultation with the departmental advisor. Rel 101 is recommended for all participating students.

Master of Arts in the field of religion—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. Of the 24 semester hours of required courses (exclusive of the thesis), at least 12 must be in third-group religion courses; a maximum of nine may be in a closely related field outside the Department of Religion as approved by the department. The Master's Comprehensive Examination must cover three fields (the thesis research must be on one of these three fields) selected from the following: the Old Testament, the New Testament, history of Christianity, Judaism, history of religion in America, modern religious thought, ethics, sociology of religion, and history of religions. A reading knowledge examination, usually in French or German, is required; however, Hebrew or Greek is acceptable for those students whose thesis area is in the Biblical field and Sanskrit or an Eastern language for those whose thesis area is in the history of religions.

Master of Arts in the field of religious education—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree. The undergraduate program should have included the following courses or equivalent: Anth 1; Educ 108; Psyc 1, 22, and 29; SpDr 1 or 11.

Required: the general requirements, pages 91–99. Of the 24 semester hours of required courses (exclusive of the thesis), at least six must be in third-group religion courses; a maximum of 12 may be in a closely related field outside the Department of Religion as approved by the department.

Master of Arts in the field of religion and medical care—Prerequisite: (1) the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree; (2) a first professional theological degree; or (3) acceptable academic work required of entering medical students who have not earned a bachelor's degree, but who are pursuing the degree of Doctor of Medicine. Certain courses in this program are offered only through off-campus centers of the College of General Studies.

Required: the general requirements, pages 91–99. The program of study consists of 36 semester hours of approved course work with or without a thesis. Students must elect course work covering four fields selected from clinical pastoral care, religion, sociology, psychology, health care administration and medicine. The course work in these fields must be distributed as follows: 12 semester hours each selected from two fields and at least six hours in clinical pastoral care. The Master's Comprehensive Examination must cover three fields selected from the list above, one of which, as approved by the department, must be outside of the Department of Religion. Supervised clinical education may be offered as a tool subject in lieu of the required reading knowledge examination in a foreign language.

Master of Arts in the field of history of religions—Hinduism—(Consortium of Universities program). Prerequisite: the Bachelor of Arts degree from this University with suitable background in the study of religion of South Asia or an equivalent degree.

Required: the general requirements, pages 91–99. The program of study consists of 24 hours of course work (exclusive of thesis) selected from upper-division and graduate courses of member universities of the Consortium as determined by the Department of Religion, including a sequence of four courses in the literature of the Hindu tradition and one course in method in history of religions. The Master's Comprehensive Examination must cover the following: methods in the study of religions, thematic comparisons between the Hindu tradition and at least two other religious traditions, including at least one Western tradition, and a special field in Hindu tradition. A reading knowledge examination in a foreign language, usually in French or German, will be required, and a student must take at least two semesters of either Sanskrit or Hindi in addition to the 30 hours of required courses for graduate credit. More complete information regarding courses and requirements is available from the program advisor, Associate Professor A. J. Hiltebeitel, Department of Religion.

Doctor of Philosophy in the field of American religious history (offered in cooperation with the Department of History)—Required: the general requirements, pages 91–94, 99–101. The General Examination must cover four fields, including two from the Department of Religion (history of religion in America and either early Christianity or European Christianity since 1500) and two from the Department of History (generally American social history and one other).

First Group

9 **The Hebrew Scriptures** (3) Jones

Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities. (Fall and spring)

10 **The New Testament** (3) Jones
Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles. (Fall and spring)

21 **Religion and the Human Search for Meaning** (3) Yeide
Traditional religious concepts, language of contemporary religion amidst modern scientific and secular intellectual tendencies, and the place of religion in today's society. (Fall)

22 **Religion and Contemporary Social Issues** (3) Yeide
Illumination of social problems by ethical reflection; examination of ethical perspectives as stimuli and barriers to social change; techniques for maintaining social values and seeking change. (Spring)

23 **Judaism: Identities and Ideas** (3) Altshuler
Exploration of important practices and beliefs in classical and modern times; study of people and texts that confront tradition and background. (Fall and spring)

57 **Eastern Spiritual Movements and the Modern West** (3) Staff
Impact of Eastern religions on Western culture (mainly British and American) through the widening of cultural horizons, the lure of the East, the popularization of the occult, transcendentalism, the "metaphysical movements," and the arrival of gurus and other missionaries from the East. Modern Western influences on Eastern religions as background.

41 **Roots of the Western Tradition** (3) Staff
Same as Clas/Engl/Hist/Phil 41. Basic ideas of western thought from early Greek, Roman, Judaic, and Christian traditions. Representative readings in drama, epic, historical writings, oratory, creation stories, scriptural traditions, philosophy, and spiritual autobiography. To be taken in conjunction with Engl 13. (Spring)

59 **Religions of the East** (3) Hiltebeitel
Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto. (Fall and spring)

60 **Religions of the West and Near East** (3) Wallace
History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments. (Fall and spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Theories in the Study of Religion** (3) Staff
Seminar taught jointly by the faculty of the Department of Religion. Analysis of different ways in which religious phenomena can be ap-

* An interdepartmental course offered by the Departments of Religion, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Political Science.

proached. Readings and discussion of some of the epoch-making books in the development of the study of religion. (Fall)

103 The Prophets (3) Quitslund

Development of the prophetic movement in Israel; cultural, economic, literary, and religious dimensions; elements of lasting value in the prophetic teaching. Study of selected prophets. (Spring)

104 The Life and Thought of Jesus (3) Quitslund

Comprehensive study of the life and teachings of Jesus with critical attention to sources. Quest for the historical Jesus. (Fall)

105 The Life and Thought of Paul (3) Quitslund

Backgrounds of early Christianity, first-century religious and social conditions affecting the spread of Christianity, the life and journeys of Paul, Paul's presentation of the Christian faith. (Spring)

107 Rabbinic Literature and Thought (3) Altshuler

Readings of the Mishna, Tosefta, Talmuds, midrashim, and liturgical works in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects. (Fall)

111 Myth, Epic and Novel (3) Hiltebeitel

Religious themes and images of the hero and their cultural significance in literature: e.g., Indo-European, Biblical, Babylonian narrative traditions; Greek epic and drama; Dante, Milton, Dostoevsky, Kafka, Hesse, Faulkner, Beckett. (Fall)

113 Early Post-Biblical Judaism (3) Altshuler

History of Judaism from the time of Ezra through the destruction of Jerusalem in 70 CE—canonization of the Pentateuch, Hellenism, Maccabean revolt, growth of sectarian movements, Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, and rabbinic and noncanonical writings. (Fall)

114 Judaism in the Rabbinic Period (3) Altshuler

From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple; apocalyptic thinking and revolt of Bar Cochba; rabbinic and patriarchal responses to Roman authority; Tannaitic and Amoraic Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature. (Spring)

115 Judaism in the Medieval World (3) Altshuler

History of relations between Jews and non-Jews. Daily life and education of the ordinary Jew; rabbinical law and interpretation of scripture; Jewish philosophers, mystics, sects and messianic movements.

116 Judaism after Emancipation (3) Altshuler

Transformation of community and beliefs among Jews beginning with catalyst of their political emancipation. Responses to beginnings of modernity among Jews in Europe, America, and Israel.

122 Christian Ethics and Modern Society (3) Yeide

Nature and principles of Christian life as developed by the Christian

community; problems of personal conduct; application to family, social, and economic institutions.

124 Contemporary Movements in Theology (3) Quitslund
Theological approach and systems of a selected number of modern theologians and/or theological movements such as process theology, liberation theology. (Fall)

126 Western Mysticism (3) Quitslund
Study of the phenomenon of religious experience and of selected mystics in Judaism, Christianity, and Islam.

127 Medicine, Religion, and Healing (1) Yeide
Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious prespective on issues in medical ethics. (Spring)

137 The Land of Israel and the Growth of the Western Religions (6) Staff

143 Early Christianity and the Spiritual Life of the Ancient World (3) Wallace
Rise and development of Christianity in relation to the culture, philosophy, mystery religions, and general religious life of the Greco-Roman world to A.D. 500. (Fall)

144 Medieval Faith and Symbolism (3) Wallace
Christian life and thought in the Middle Ages; mystics, saints, popes, and philosophers. (Spring)

145 Religious Currents in the Renaissance and Reformation (3) Wallace
Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason.

146 Christianity in the Modern World (3) Wallace
Changes in Christian life and thought since 1700 as seen in theology, literature, political life, and religious institutions.

155 Anthropological Approaches to Religion (3) Simons, Wagner
An interdepartmental course offered by the Anthropology and Religion Departments. Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change. (Spring)

157 Indian Philosophy and Mysticism (3) Hiltebeitel
Indian speculative and mystical traditions; late *Vedas, Upanishads, Bhagavad Gita,* Buddhist, and Hindu soteriological systems. (Fall)

158 Ancient Indian Literature and Religion (3) Hiltebeitel
Studies of foundational texts of Hinduism, especially *Rig Veda, Brahmanas, Mahabharata,* (including the *Bhagavad Gita*); attention to Hinduism's archaic and seminal themes. (Spring)

159 Mythologies of India (3) Hiltebeitel
The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy men (Hindu, Buddhist, Jain, Tantric); ties with Indian caste, cult, cosmology, and spiritual ideals.

160 **Buddhism** (3) Hiltebeitel
Origin, development, and contemporary status of Buddhist life and thought; its impact on the Near East. (Spring)

161 **Islam** (3)
Origin, development, and contemporary status of Islamic life and thought; its impact on the Near East. (Spring)

162 **Symbolism in the History of Religions** (3) Hiltebeitel
Religious symbolism, myth, legend, and ritual in the religions of the world; various theoretical analyses.

172 **Religion in American Culture** (3) Wallace
Growth of religious bodies and institutions in relation to American culture, development of religious thought, and analysis of the contemporary religious scene. (Fall)

174 **American Judaism** (3) Altshuler
Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, diaspora, the Holocaust, family and community dynamics. (Spring)

181 **Women in Western Religion** (3) Quitslund
Historical, theological, and ethical investigation of the image and role of women in Judaism and Christianity; special consideration of the Biblical experience, the sexual qualifications for religious office, use of male-female images and languages, and contemporary issues. (Fall)

184 **The Thought of Martin Buber** (3) Jospe
Basic principles underlying the Life of Dialogue and application of those principles to all strata of life from interpersonal relationships to the religious realm. (Spring)

191 **Senior Honors Thesis** (3) Staff
Required of and open only to undergraduate honors candidates in religion. (Fall and spring)

Third Group

209–10 **Seminar: Biblical Studies** (3–3) Jones
Main problems of Biblical literary, historical, and theological criticism. (Academic year)

213 **Seminar: Judaism in Late Antiquity** (3) Altshuler
Selected topics.

222 **Seminar: Ethics** (3) Yeide
Selected topics. (Spring)

235 **Seminar: Roman Catholicism in the Modern World** (3) Quitslund
Important leaders and their ideas in selected developments since 1800—doctrinal, spiritual, biblical, liturgical, and ecumenical. Emphasis on 20th century.

237 **Seminar: Theological Analysis** (3) Quitslund
Historical and topical study of the development of important ideas in such areas as Christology, ecclesiology, and death. (Spring)

238 **Seminar: Contemporary Judaism** (3) Altshuler
Selected topics. (Fall)

262 **Seminar: History of Eastern Religions** (3) Hiltebeitel
Selected topics.

271 **Seminar: American Religious History to 1830** (3) Wallace
Religious thought and life during the Colonial and early National period. (Fall)

273 **Seminar: American Religious History since 1830** (3) Wallace
Religious thought and life from the Civil War to the present.

291–92 **Readings and Research** (3–3) Staff
Investigation of special problems. (Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ROMANCE LANGUAGES AND LITERATURES

Professors J.W. Robb, G.E. Mazzeo *(Chairman)*, J.A. Frey, J.F. Burks
Associate Professors M.A.B. Coffland, P.G. Sáenz, G. Ludlow, S.R. Barnett
Assistant Professors G.P. Huvé, J.E. Hicks, I. Azar, J.M. Thibault, M. Cruz-Sáenz

Bachelor of Arts with a field-of-study major in (1) French language and literature, (2) Spanish language and literature, (3) Spanish-American literature, or (4) any approved combination selected from two of the preceding fields—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Prerequisite courses—Fren 1–2, 3–4, 9–10, or equivalent; or Span 1–2, 3–4, 9–10, or equivalent.

3. Required introductory literature courses—Fren 51–52 or 91–92, or Span 51–52 or 91–92.

4. Required for the major:

There is no specific program of required courses. The student, however, is expected to demonstrate a knowledge of his or her field in breadth and depth by passing a comprehensive examination at the end of the senior year. A proseminar is required as follows: Fren 199–200 for French language and literature majors; Span 199–200 for Hispanic language and literature majors.

Minor in French or Hispanic languages and literatures—Required: 6 semester hours of French or Spanish 51–52 or 91–92; 12 additional hours selected from among French or Spanish courses numbered 9 and above.

Master of Arts in the fields of (1) French literature, (2) Spanish literature, (3) Spanish-American literature, or (4) an approved combination of Spanish and Spanish-American literatures—Prerequisite: the degree of Bachelor of Arts in the appropriate field from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. The program of study consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours), or, with the approval of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Doctor of Philosophy fields of study in Romance literatures—Required: the general requirements, pages 91–94, 99–101. There are four fields: French literature; Spanish literature; Spanish-American literature; and any approved combination of French, Spanish, or Spanish-American literature.

Bachelor of Arts in Education and Human Development with teaching fields in French and in Spanish—Prerequisite: the education curriculum, pages 114–15. Required: the French option or the Spanish option and the professional courses listed on pages 118–19.

Placement Examinations: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

FRENCH

Departmental prerequisite: Fren 3–4 or 6, or equivalent, is prerequisite to all courses in French, from Fren 9 and above, except for courses offered in English translation.

First Group

1–2 First-year French (3–3) Burks and Staff

A year course; credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 Second-year French (3–3) Thibault and Staff

A year course; credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1–2. Laboratory fee, $17.50 per semester. (Fall and spring)

6 Second-year French (6) Thibault and Staff

Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Fren 3–4. Prerequisite: Grade of *B* or better in Fren 2. Laboratory fee, $17.50. (Fall and spring)

9 Contemporary French Conversation (3) Huvé and Staff

Emphasis on self-expression in a controlled situation. Special attention to the acquisition and active use of a flexible vocabulary. Oral and written reports and exercises. Prerequisite: Fren 4 or equivalent. (Fall and spring)

10 French in Written Context (3) Huvé and Staff

Study of vocabulary and syntax. Discussion of texts, reports, compositions, and translations into French. Prerequisite: Fren 9 or equivalent. (Fall and spring)

49 French for Graduate Students (0) Burks and Staff

For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of three credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of French Literature** (3–3) Thibault, Frey
Readings in French literature from the Middle Ages to the present. Lectures, readings, and informal discussions. (Academic year)

60 **Contemporary French Civilization** (3) Ludlow
Study of contemporary France as seen through its cultural, political, economic and social life, its geography, language, population and character. Class lectures and discussion of texts supplemented by slides, films, tapes and records. Conducted in English. (Summer)

91–92 **Analyse de texte** (3–3) Thibault
Methodology and vocabulary of literary criticism; application of principles of *explication de texte* to selections from prose, drama, and poetry from the Renaissance to the present. (Academic year)

Second Group

103 **Oral French With Emphasis on Pronunciation** (3) Huvé
The sounds of French; elements of phonetics. Exercises in reading and conversation with attention to accent, rhythm, and intonation. Prerequisite: Fren 10. (Fall)

108 **Advanced French Grammar** (3) Thibault
Compositions, drills, dictations. Translations into French. Prerequisite: Fren 10. (Spring)

109 **Advanced French Conversation** (3) Huvé and Staff
Readings and discussions based on French culture and civilization. Oral and written reports. Prerequisite: Fren 10. (Fall)

110 **Advanced Written French** (3) Huvé and Staff
Study of vocabulary and syntax with emphasis on stylistic devices. (Spring)

119 **French Literature of the Middle Ages** (3) Cruz-Sáenz
Literary history and development of ideas. Readings in the epic, courtly lyric, satire, and drama. Analysis of texts and discussion of criticism. (Fall)

120 **French Literature of the Renaissance** (3) Staff
Prose writers of the Renaissance from Rabelais to Montaigne; poetry and poetic theory in the Renaissance from the *Grands Rhétoriqueurs* to the *Pléiade*. (Spring)

121 **17th-Century Classical Theater** (3) Burks

122 **17th-Century Prose and Poetry** (3) Burks
(Spring)

123 **The 18th-Century Novel and Theater** (3) Ludlow
Study of the major French novelists and dramatists of the period. Emphasis on the works of Marivaux, Voltaire, Diderot, Rousseau, Laclos, and Beaumarchais.

124 **The 18th-Century Enlightenment** (3) Ludlow
The contribution of Montesquieu, Voltaire, Diderot, and Rousseau to European and American thought of the period. (Fall)

125 **Topics in 19th-Century French Literature** (3) Frey

126 **Topics in 19th-Century French Poetry** (3) Thibault
(Spring)

127 **20th-Century French Literature I** (3) Coffland
Fiction, poetry, and drama from 1900 to 1930. Chronological examination of authors and movements.

128 **20th-Century French Literature II** (3) Coffland
Fiction, poetry, and drama from 1930 to the present. Chronological examination of authors and movements. (Fall)

130 **Correspondences between Art and Literature** (3) Thibault
Expression of common preoccupations in diverse media. Readings, slides, lectures, and informal discussions. Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Summer)

133 **Seminar: French Literature** (3) Frey
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

151 **Cinema and Literature** (3) Thibault
Interaction between film and literature; aesthetic theories and their applications to film and literary genres. Selected films and readings. May be repeated for credit. (Summer)

199–200 **Proseminar: Readings for the Major** (3–3) Burks and Staff
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

202 **Thème et version** (3) Ludlow
Limited to graduate students; open to others only by permission of the instructor. Required of all graduate students in the field of French language and literature. Analysis and translation of selected prose passages, alternating between French and English; designed to teach students to write with precision and clarity.

213 **Medieval French Literature** (3) Cruz-Sáenz
Topic to be announced in the *Schedule of Classes*. Study of the origins and development of modern French from its Latin beginnings through Old and Middle periods. Some knowledge of Latin is desirable but not necessary. May be repeated for credit.

214 **Seminar: Special Topics in Medieval French Literature** (3) Cruz-Sáenz
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Spring)

221 **Special Problems in 16th-Century French Literature** (3) Burks
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

229–30 **Literary Renaissance in Europe** (3–3) Burks
Study of the developments in the poetry of Italy, France, and England. (Academic year)

231–32 **Theater in the 17th Century** (3–3) Burks
Survey of the development of theatrical arts and the drama. Research papers and reports.

234 **17th-Century Nondramatic Literature** (3) Ludlow
Study of the poetry, novel, and philosophical writings of the Baroque and Classical periods. (Fall)

241 **The Age of Enlightenment in Europe** (3) Ludlow
The contribution of the *philosophes* to the intellectual evolution of France and Europe. Emphasis on the relations among French, English, and German thought. Readings in English and French.

242 **Seminar: the French Novel and Theater in the 18th Century** (3) Ludlow
Major 18th-century French novelists and dramatists and a comparison of their work with that of some English and German writers of the period. Readings in English and French. (Spring)

244 **Special Problems in 18th-Century French Literature** (3) Ludlow
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

253 **Special Problems in 19th-Century French Literature** (3) Thibault
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

258 **Special Problems in 19th-Century French Poetry** (3) Thibault
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

264 **Seminar: Modern Period** (3) Coffland
Narrative voices and new directions in the 20th-century novel.

265 **20th-Century French Theater** (3) Coffland
Survey of the development of the theater from 1900 to the present.

266 **20th-Century French Poetry** (3) Coffland
Background and development of poetry in the 20th century; *explication de texte* approach. (Spring)

295 **Independent Reading and Research in French Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring) Staff

299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the Department of Romance Languages and Literatures.

301–308 **Folger Institute Seminar** (3 each) Staff
Topics will be announced.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ITALIAN

First Group

1–2 **First-year Italian** (3–3) Coffland and Staff
A year course; credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Academic year)

3–4 **Second-year Italian** (3–3) Coffland and Staff
A year course; credit toward a degree at this University given on completion of Ital 4. Conversation, grammar review, composition, reading of modern Italian prose, introduction to Italian civilization. Oral practice in language laboratory. Prerequisite: Ital 1–2. Laboratory fee, $17.50 per semester. (Academic year)

9–10 **Italian Conversation and Composition** (3–3) Coffland and Staff
Prerequisite: Ital 4 or equivalent and permission of instructor. (Academic year)

11 **Italian through Opera** (0) Chambers
Conversational Italian presented through excerpts from operas and their libretti. Pronunciation and grammatical principles, vocabulary, and conversation. Tuition will be charged at the rate of one credit hour. (Summer)

Third Group

295 **Independent Reading and Research in Italian Literature** (arr.)
For students preparing for the Master of Arts or Doctor of Philosophy degree. May be repeated for credit. (Fall and spring)

PORTUGUESE

First Group

31–32 **Intensive Portuguese** (3–3) Robb
Prerequisite: knowledge of one other Romance language. (Academic year)

SPANISH

Departmental prerequisite: Span 3–4 or 6, or equivalent, is prerequisite to all courses in Spanish, from Span 9 and above, except for courses offered in English translation.

First Group

1–2 **First-year Spanish** (3–3) Hicks and Staff

A year course; credit toward a degree at this University given on completion of Span 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 **Second-year Spanish** (3–3) Hicks and Staff

A year course; credit toward a degree at this University given on completion of Span 4. Conversation, grammar review, composition, reading of modern Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2. Laboratory fee, $17.50 per semester. (Fall and spring)

6 **Second-year Spanish** (6) Hicks and Staff

Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Span 3–4. Prerequisite: grade of *B* or better in Span 2. Laboratory fee, $17.50. (Fall and spring)

9–10 **Spanish Conversation and Composition** (3–3) Hicks and Staff

Conversation, composition, vocabulary, and syntax. Prerequisite: Span 4 or equivalent. (Fall and spring)

12 **Spanish Conversation and Composition (Intensive)** (6) Hicks and Staff

Intensive, accelerated course which covers the material of Span 9–10. (Fall and spring)

20 **Prensa y Cultura: Intensive Spanish Conversation** (3) Azar and Staff

Intensive conversation organized around specific contemporary topics; illustrated by periodical material, films and interviews. (Summer)

49 **Spanish for Graduate Students** (0) Hicks and Staff

For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of three credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of Spanish Literature and Civilization** (3–3) Barnett

Social, artistic, and cultural background of Spanish literature. Lectures, readings, recitations, and informal discussions. (Academic year)

91–92 **Explicación de Textos** (3–3) Sáenz

Analytical introduction to Spanish and Spanish-American literature. Method demonstrated and practiced on selected passages. (Academic year)

Second Group

109–10 **Advanced Spanish Conversation and Composition** (3–3) Mazzeo and Staff

Development of writing and speaking skills. Emphasis on diction, grammar, and style. Prerequisite: Span 10 or equivalent. (Academic year)

119–20 **Medieval Spanish Literature** (3–3) Cruz-Sáenz
Survey by genre of the literature of the Middle Ages.

121–22 **Spanish Literature of the Golden Age** (3–3) Azar
Span 121: poetry and drama; Span 122: prose. (Academic year)

123–24 **Cervantes: Don Quijote** (3–3) Azar
The *Quijote* and the novel as a literary genre: reality and fiction.

125–26 **Modern Spanish Literature** (3–3) Mazzeo
Prose, poetry, and drama of the 18th and 19th centuries. Class analysis of texts, collateral readings, lectures on literature and history.

127–28 **Contemporary Spanish Literature** (3–3) Sáenz
Prose, poetry, and drama of the 20th century. Class analysis of texts, collateral readings, lectures on literature and history. (Academic year)

130 **The Modern Spanish Essay** (3) Mazzeo
Development of the Spanish essay from the 16th through the 20th centuries; emphasis on the 18th and 19th centuries. Class analysis of texts, collateral readings, and lectures. (Summer)

133 **Feminist Authors in Hispanic Literature** (3) Mazzeo
Development of feminist themes in Hispanic literature. Class analysis of representative works with readings in Spanish or in English translation. (Summer)

137 **The Spanish Civil War and the Creative Artist** (3) Barnett
Historical and literary study of the Spanish Civil War and the subsequent artistic reaction in Spain, Great Britain, France and the U. S. Taught in English with readings in Spanish or English. (Summer)

141 **New Spanish-American Narrative** (3) Robb
Short stories of Borges, Cortázar, Fuentes, Arreola, Carpentier, García Márquez. (Summer)

143 **Latin America: A Literary-Cultural View** (3) Robb
Contemporary Latin America: its culture and society as seen through its writers. (Summer)

151–52 **The Spanish-American Novel** (3–3) Robb
Development of the novel in Spanish America. Lectures, collateral readings, and class analysis of texts.

155–56 **Spanish-American Literature to 1880** (3–3) Robb
Literature of Spanish America from the colonial period to the latter part of the 19th century. Lectures, collateral readings, reports, and class analysis of important works. (Academic year)

157–58 **Spanish-American Literature since 1880** (3–3) Robb
Literature of Spanish America from 1880 to the contemporary period. Lectures, collateral readings, reports, and class analysis of important works.

199–200 **Proseminar: Readings for the Major in Hispanic Language and Literatures** (3–3) Barnett
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

215 **Seminar: Medieval Literature** (3) Cruz-Sáenz
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

221 **Seminar: Cervantes' "Don Quijote"** (3) Azar
Cervantes' literary theories, the *Quijote* and its relations with the other *novelas cervantinas* as different modes of representing reality in literary fiction.

224 **Seminar: "La Celestina"** (3) Azar

225 **Seminar: Special Problems in Golden-Age Literature** (3) Azar
Topic for 1981: 16th-century literature; topic for 1982: 17th-century literature. May be repeated for credit. (Fall and spring)

231 **Seminar: 18th-Century Spanish Writers** (3) Mazzeo
Lectures and analysis of principal authors and works; relationships with subsequent literary movements. (Fall)

242 **Seminar: Spanish Romanticism** (3) Mazzeo
Lectures and analysis of principal authors and works. Collateral readings. Problems of origins and development. (Spring)

244 **Seminar: Naturalism and the Spanish Novel** (3) Mazzeo
Development of Naturalism in 19th-century Spain. Analysis of representative works of Pardo Bazán, Clarín, Blasco-Ibáñez and others.

246 **Seminar: Works of Galdós** (3) Barnett
Ideological and stylistic analysis: relationship of Galdós' works to literary movements of the second half of the 19th century.

248 **Seminar: Spanish Lyric Poetry of the 20th Century** (3) Sáenz
Stylistic analysis of the most significant poets from 1898 to the present.

250 **Seminar: Novecentismo y Literatura de Entreguerras** (3) Sáenz
The prose writers: intellectualism and new forms of expression. (Spring)

251 **Seminar: Works of Unamuno and Ortega y Gasset** (3) Sáenz
Study of the thought of Unamuno and Ortega y Gasset; analysis and commentary on the texts. (Fall)

252 **Spanish Literature since the Civil War** (3) Sáenz
Development of the Spanish novel since 1939.

253 **Seminar: Studies in Modern Spanish-American Poetry** (3) Robb
Poetic trends studied in selected poets and groups of poets from the Modernists through Post-modernists and Vanguardists to the present.

255 **Seminar: Studies in 20th-Century Spanish-American Theater** (3) Robb
Trends in modern theater with emphasis on Mexico, Central America, Puerto Rico, Chile, and the Río de la Plata area.

256 **Seminar: Studies in Mexican Narrative Prose** (3) Robb
Study of the emergence and development of the "New Mexican Narrative" through the works of Yáñez, Rulfo, Arreola, Fuentes, Leñero, and others. (Fall)

261 **Seminar: Studies in the Spanish-American Short Story and Essay** (3) Robb
The Spanish-American short story and essay as artistic forms; selected modern short story writers and essayists.

264 **Seminar: Studies in Recent Spanish-American Fiction** (3) Robb
The "New Spanish-American Narrative" studied in the novels and short stories of Borges, Bioy Casares, Cortázar, Vargas Llosa, García Márquez, Carpentier, Cabrera Infante, and others. (Spring)

266 **Seminar: Alfonso Reyes: Essayist, Poet, Narrator** (3) Robb
Alfonso Reyes—essayist, poet, narrator and complete literary humanist—studied in his various prose and poetic works.

287 **Seminar: Problems in Latin-American Civilization** (3) Staff
Same as Anth/Econ/Geog/Hist 287, and PSc 285. Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

295 **Independent Reading and Research in Spanish and Spanish-American Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SANSKRIT

See **Germanic Languages and Literatures.**

SERBO-CROATIAN

See **Slavic Languages and Literatures.**

SERVICE-LEARNING PROGRAM*

Associate Professor S. Greene
Adjunct Associate Professor L.J. Lear
Assistant Professors H. Nashman, N.C. Garner, D.J. Lynn
Adjunct Instructor L.P. Love *(Coordinator)*

* Administered by the Division of Experimental Programs.

Love

151 Urban Legal Services (6)

Field work (16–20 hours per week) and academic study of the urban legal system. Role of urban legal system in promoting humanistic values and enhancing social change. Admission by permission of instructor. (Fall and spring)

Nashman

152 Issues in Education and Human Services (6)

Exploration of the effects of education on society and vice versa; opportunities for experience, study, and service (16–20 hours per week) in public, private, museum, hospital, and community education centers. Admission by permission of instructor. (Fall and spring)

Lynn

153 Issues in American Health Care (6)

Field work combined with academic study of present American health care system and its problems: cost, quality of care, delivery of health care, ethical issues, health education, consumer issues, etc. Field placements (16–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

Love

154 Independent Study (3 or 6)

Field work combined with academic study, involving field-placements and complementary academic program of study, under the supervision of an appropriate faculty member. Students must "contract" with the agency, the faculty member, and the Service-Learning Program. Admission by permission of instructor. (Fall and spring)

Garner

155 Issues in Managing the Arts (6)

Studies in the purpose and operation of the arts organizations in Washington. Weekly seminars and placement in an internship in an arts organization (16–20 hours per week). Discussion topics focus on the process of communication between artists and the public, the government, and the business community. Open to students with a demonstrated interest in the arts and the maturity to perform in a responsible position in an arts organization. (Fall and spring)

Greene

156 Community Planning and Development (6)

Field work combined with academic study of the role of urban and regional planning in analyzing and responding to the needs of an urban society. Field placements (16–20 hours per week) in a public agency or in the private sector. Admission by permission of instructor. (Fall and spring)

Staff

157 Social Issues in Engineering (3)

Provides the opportunity to explore social policy and value issues within the engineering profession. Students must enroll concurrently in EngS 206. Seminars will focus on energy and field placements (16–20 hours per week) will be in energy-related offices. Admission by permission of instructor. (Fall and spring)

Lear

158 Society and Aging (6)

Exploration of the challenges posed by the rise in the median age of our population and the significant increase in the number of older Americans. Field work combined with academic study of the impact of these changes on political and economic institutions and on cultural values. Admission by permission of instructor. (Fall and spring)

SINO-SOVIET STUDIES

See **Institute for Sino-Soviet Studies.**

SLAVIC LANGUAGES AND LITERATURES

Professors H.B. Yakobson, C.A. Moser *(Chairman)*, N.N. Natov
Associate Professors G.A. Olkhovsky, W.W. Rowe, I. Thompson
Assistant Professor M.F. Miller
Assistant Professorial Lecturer S. Ficks

Bachelor of Arts with a major in Russian language and literature (field-of-study or departmental)—The following requirements must be fulfilled.

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Slav 5–6 (preferred), or Slav 1–2, 3–4; or equivalent; and Slav 91–92.
3. Required for the major:

Field-of-study major—By the end of the senior year the student will be expected to have a good command of language skills and a grasp of the fundamentals of Russian structure, as well as a good foundation in Russian literature and culture. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

Departmental major—from 30 to 36 semester hours of course work in the Department of Slavic Languages and Literatures distributed as follows: Language—12 to 15 hours chosen from Slav 9–10, 101, 103, 104, 109–10, 125; Culture and Civilization—six hours chosen from Slav 161–62, 172; Literature in Russian—six hours chosen from Slav 141, 142, 151, 152; Literature in English Translation—six to nine hours chosen from second-group courses.

A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to six semester hours of second-group courses.

Bachelor of Arts with a major in Russian literature and culture—in translation (field-of-study)—The following requirements must be fulfilled.

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Slav 47 and 49, or Slav 1–2 and 3–4, or equivalent; and Slav 91–92.
3. By the end of the senior year the student will be expected to have a good grasp of Russian literature and the principles of literary criticism, as well as a general knowledge of Russian culture and history. The passing of a major examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive any or all of the first-group language or literature courses, as well as up to six semester hours of second-group courses.

Master of Arts in the field of Russian language and literature—Two areas of concentration are offered: Russian literature and Russian language.

Prerequisite: the degree of Bachelor of Arts with a major in Russian language and literature or Russian literature and culture—in translation from this University, or an equivalent degree. A student planning a concentration in Russian language must pass a Russian language entrance examination and must have a general knowledge of Russian literature and an acquaintance with Russian history and culture. A student planning a concentration in Russian literature

must have a general knowledge of Russian literature, an acquaintance with Russian history and culture, and a general proficiency in the Russian language as demonstrated by the passing of a Russian language entrance examination.

Required: the general requirements, pages 91–99. All candidates must pass a reading knowledge examination in French, German, or a Slavic language other than Russian; a Russian language proficiency examination upon completion of 15 semester hours of course work; and a Master's Comprehensive Examination. Additional specific requirements are:

Concentration in Russian language: 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) or 30 semester hours of approved course work without a thesis. The following courses are acceptable for the satisfaction of these requirements: Slav 152, 181, 186, 211, 212–13, 215, 218, 220, 225, 295; and Slav 101, 103, 104, with a translation project in consultation with a faculty member.

Concentration in Russian literature: 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) or 30 semester hours of approved course work without a thesis. Courses must include Slav 212–13 and at least 18 hours of literature.

Bachelor of Arts in Education and Human Development with a teaching field in Russian—Prerequisite: the education curriculum, pages 114-15.

Required: the Russian option and the professional courses listed on page 119.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

First Group

1–2 First-year Russian (3–3) Yacobson, Miller

Beginners' course in fundamentals of grammar and pronunciation. Slav 1 is prerequisite to Slav 2. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 Second-year Russian (3–3) Yacobson, Miller

Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1–2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 Intensive Beginning Russian (6–6) Thompson and Staff

Classroom (7 hours), laboratory (1 hour). Beginners' intensive course in the fundamentals of Russian. Prerequisite to Slav 6: Slav 2 or 5. Laboratory fee, $17.50 per semester. (Academic year)

9–10 Intermediate Russian Conversation and Composition (3–3) Miller

Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor. (Academic year)

11–12 Individualized Beginning Russian (3–3) Staff

13–14 Individualized Intermediate Russian (3–3) Staff

31–32 Elementary Polish (3–3) Staff

Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

41–42 **Elementary Serbo-Croatian** (3–3) **Staff**
Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 42: Slav 41 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

47 **Beginning Russian for Reading** (3) Staff
For undergraduate and graduate students with little or no Russian who wish to acquire a reading knowledge of the language. No academic credit for graduate students. (Summer)

49 **Russian Reading** (3) Staff
Primarily for graduate students preparing for reading examinations. No academic credit for graduate students. Prerequisite: Slav 47 or equivalent. (Summer)

51–52 **Elementary Bulgarian** (3–3) **Moser**
Beginners' course in fundamentals of grammar and pronunciation. Prerequisite to Slav 52: Slav 51 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

71 **Soviet Civilization** (3) Olkhovsky
Survey of the Soviet Union's past and present development. Lectures, discussion, visual aids—in English. (Fall)

91–92 **Introduction to Russian Literature** (3–3) **Moser**
Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English. (Academic year)

Second Group

101 **Readings in the Soviet Press** (3) **Ficks**
Representative reading and translation of Soviet periodicals and current publications in social sciences. Prerequisite: Slav 4, 6, 49, or permission of instructor. (Fall)

103 **Scientific Russian** (3) **Ficks**
Representative readings in the major fields of Russian contemporary scientific literature. Prerequisite: Slav 4, 6, 49, or permission of instructor. (Spring, even years)

104 **Business Russian** (3) **Ficks**
Study of Russian business vocabulary and concepts of business in the Soviet context. Prerequisite: Slav 4, 6, 49, or permission of instructor. (Spring, odd years)

109–10 **Advanced Russian Conversation and Composition** (3–3) Yacobson
Developing proficiency in oral and written expression. Prerequisite: Slav 10 or equivalent. (Academic year)

125 **Special Problems in Russian Grammar** (3) Thompson
Study of selected areas of Russian grammar: emphasis on their practical use. Prerequisite: two years of Russian or permission of instructor. (Summer)

128 **Dostoevsky: The Man and the Artist** (3) **Natov**
Sources and development of Dostoevsky's philosophical, religious, and aesthetic ideas. His influence on Russian and Western literature. Lectures, discussions, and reports—in English. (Fall)

141 **Readings in 19th-Century Russian Prose** (3) Rowe
Reading of representative prose texts of the 19th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Fall, even years)

142 **Readings in 19th-Century Russian Poetry** (3) Rowe
Reading of representative lyric poetry of the 19th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Spring, odd years)

143–44 **The Russian Novel** (3–3) Moser
Study of representative novels of the 19th and 20th centuries—in English.

151 **Readings in 20th-Century Prose and Poetry** (3) Natov
Reading and discussion of representative prose and poetry of the 20th century—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Fall, odd years)

152 **Russian Drama** (3) Natov
(Formerly 20th-Century Russian Literature)
Readings of the most representative plays of the 19th and 20th centuries. Reports and class discussion—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Spring, even years)

156 **Leo Tolstoy: His Life and Works** (3) Rowe
Evolution of Tolstoy's artistic and philosophical ideas. Tolstoy's impact on Russian literature and society. Lectures, reports, and classroom analysis of his major works—in English. (Spring)

161–62 **Russian Culture** (3–3) Olkhovsky
Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports. (Academic year)

165 **Soviet Literature from the Revolution to World War II** (3) Natov
Basic themes, trends, and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English. (Fall)

166 **Soviet Literature from World War II to the Present** (3) Natov
Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s and 1970s. Lectures, discussions, reports—in English. (Spring)

172 **Soviet Dissent** (3) Olkhovsky
Examination of artistic and intellectual dissent since the death of Stalin; underground press, songs, plastic arts—in English. (Spring)

181 **Russian-English Oral Translation** (3) Staff
Training in the special skill of oral translation from Russian into English. Prerequisite: Slav 109-10, or equivalent.

186 **The Russian Short Story** (3) Natov
(Formerly Slav 146)
Development of the Russian short story since 1800. Lectures, reports, and class discussion—in Russian. Prerequisite: Slav 9-10 or equivalent. (Spring, odd years)

199–200 **Proseminar: Readings for the Major** (3–3) Staff
Conferences and group discussions. (Academic year)

Third Group

211 **Russian Phonology** (3) Thompson
Linguistic analysis of the phonology of standard contemporary Russian. An appropriate knowledge of Russian is required. (Fall)

212 **Russian Syntax I** (3) Thompson
(Formerly Russian Morphology)
Linguistic analysis of the syntax of simple sentences in standard contemporary Russian. Lectures, discussion, independent research—in Russian. (Fall)

213 **Russian Syntax II** (3) Thompson
Linguistic analysis of the syntax of compound sentences in standard contemporary Russian. Lectures, discussion, independent research—in Russian. (Spring)

214 **Methodology of Teaching Russian** (3) Thompson
Survey of modern methods, techniques, and materials for teaching Russian as a foreign language. Examination of textbooks, classroom observation, practice teaching. Prerequisite: 18 semester hours of Russian language. (Spring)

215 **Russian Historical Grammar** (3) Moser
An analysis of the historical development of Russian phonology, morphology, and syntax. An appropriate knowledge of Russian is required. (Fall, odd years)

218 **History of the Russian Literary Language** (3) Moser
The development of the norms of the Russian literary language from earliest times to the present. An appropriate knowledge of Russian is required. (Spring, even years)

220 **Russian Stylistics** (3) Natov
Analysis of various styles of contemporary Russian from the point of view of vocabulary and structure—in Russian. (Spring, odd years)

224 **Russian Literature to 1800** (3) Moser
(Formerly Slav 191)
Survey of Russian literature from the earliest times to the end of the 18th century. Appropriate knowledge of Russian required.

225 **Pushkin and the Poets of his Time** (3) Natov
Pushkin's predecessors; Pushkin's poetry and drama; Lermontov, the heir to Pushkin's poetic tradition—in Russian. (Fall, odd years)

253 **Seminar: Literary Criticism** (3) Natov
Study of leading Russian critics and their role in the development of Russian literature; the emergence of various literary schools—in Russian. (Spring, even years)

254 **Seminar: Literary and Intellectual Currents of the 1860s** (3) Moser
Discussion of literary and intellectual developments in the Russia

of the 1860s. Reading knowledge of Russian required. (Spring, odd years)

255 **Seminar: Main Trends in 20th-Century Russian Literature** (3) Natov
Study of representative works since 1900; their artistic and social value—in Russian. (Fall, even years)

295 **Independent Reading and Research** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

SOCIOLOGY

Professors R.W. Stephens, I.H. Cisin, R.G. Brown, T.F. Courtless, Jr., P.H.M. Lengermann, R.A. Wallace
Associate Professors P.L. Stewart *(Chairman)*, J.L. Tropea
Assistant Professors T. Dietz, R.S. Frey

Bachelor of Arts with a major in sociology (departmental)—Four categories of majors are offered: (a) general major; (b) general major with a special concentration in crime, deviance, and justice; (c) general major with a special concentration in public policy; (d) criminal justice major. Options (b), (c), and (d) require departmental approval. The following requirements must be met:

1. The general requirements as stated on pages 74, 81–87. (Students must consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Soc 1.
3. Required courses in related areas—12 semester hours in one of the following related social science fields; anthropology, economics, geography, history, political science, or psychology.
4. Required courses in the general major—Soc 101, 140–41, 149; general majors: 15 additional semester hours in second-group sociology courses; concentration in crime, deviance, and justice: Soc 135, 136, 137, 139, and one additional second-group sociology course; concentration in public policy: Soc 120, 122, 128, 181, and one additional second-group course in sociology. Required courses in the criminal justice major—Soc 135, 136, 137, 139, 151 (9 credits), three additional second-group sociology courses, plus Anth 156, Phil 142, PSc 115, Psyc 130 and 154.

Minor in Sociology—A minimum of 15 hours of course work, including Soc 1, a basic course in either theory or methods, and nine hours of electives in courses at the 100 level or higher are required. There are two categories of minor: (a) a general minor; (b) a special concentration in one of the areas of concentration offered by the department, such as public policy or crime, deviance, and justice. Option (b) requires departmental approval. All students wishing to minor in sociology must seek departmental advising.

Master of Arts in the field of sociology—Prerequisite: a bachelor's degree with a major in sociology or in an approved related field. Applicants should present scores on the Graduate Record Examination, especially in the Verbal and the Quantitative Tests, and arrange for former professors to write letters of reference to the Graduate School of Arts and Sciences.

Required: the general requirements, pages 91–99. With the approval of the advisor and of the Graduate Education Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to six semester hours), satisfactory completion of a Master's Comprehensive Examination in sociological theory and social research methods and an oral defense of the thesis proposal; or (2) at least 33 semester hours of graduate course work and satisfactory completion of a Master's Comprehensive Examination in sociological theory, social research methods, and one substantive special field (deviant behavior, political sociology, sociology of work, comparative social change, health policy, and social policy). Fifteen semester hours of elective courses must be interrelated in a logical way to form a subspecialization; 6 hours may be taken outside of the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. Students majoring in social policy need an additional statistics course; Stat 118 or 221 is suggested. All candidates must select from the graduate sociology courses as follows: six hours chosen from sociological theory (Soc 238 and 239 are recommended), six hours chosen from social research methods (Soc 230 and 231 are recommended), and six hours chosen from one special area (deviant behavior, political sociology, sociology of work, comparative social change, health policy, and social policy). Candidates must also fulfill the tool requirement by passing a reading knowledge examination in one foreign language, by satisfactorily completing the quantitative tool option, or by satisfactorily completing the graduate course work option.

Doctor of Philosophy in the field of sociology—Required: the general requirements, pages 91–94 and 99–101. Students must complete from 30 to 36 semester hours of graduate course work, and from 12 to 18 semester hours of dissertation research, for a total of 48 hours beyond the master's degree. Students must include in their program of study Soc 332 and 6 semester hours of graduate course work in each of the following: sociological theory, social research methods, and two substantive specialties, at least one of which must be chosen from among those offered by the Department of Sociology—deviant behavior, political sociology, sociology of work, health policy, social policy, and comparative social change. Students must satisfactorily complete the General Examination in sociological theory, social research methods, and two substantive specialties. Students must also fulfill the tool requirement by taking any two of the following options: a reading knowledge examination in one foreign language, the quantitative tool option, or the graduate course work option.

Departmental prerequisite: Soc 1 is prerequisite to all sociology courses except Soc 181 and 191.

First Group

1 Introductory Sociology (3) **Staff**
General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior. (Fall and spring)

2 Major Social Issues (3) **Staff**
Critical examination of selected social issues in contemporary American society. (Fall and spring)

Second Group

101 Development of Social Thought (3) **Lengermann, Stephens**
An exploration of the emergence and growth of sociology from 1800

to 1930, with emphasis on the elaboration of sociological concepts and theories. (Fall)

120 **Sociology and Public Policy** (3) Dietz
Introduction to concepts, theory, and research illustrating the application of the sociological perspective to public policy. (Fall)

122 **Cases in Policy Analysis** (3) Dietz
Sociological analysis of topical issues in public policy (e.g., education, health, energy, welfare). (Spring)

124 **Medical Sociology** (3) Stewart, Brown
Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services. (Fall)

125 **Sociology of Religion** (3) Wallace, Yelde
An analysis of the relationships between religion and society. Topics include the emergence of uniquely American religious forms such as civil religion and cultic groups. (Fall, odd years)

126 **Urban Sociology** (3) Frey
The sociological dynamics of the city and of urban growth in the United States; urban conflict, class conflict, and racism; problems of urban decay, crime and deviance, political competition, and revolt. (Fall)

127 **Population Problems** (3) Stewart, Dietz
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control. (Fall)

128 **Comparative Urban Sociology** (3) Frey
Processes of urbanization outside the United States; contrasts between socialist and non-socialist approaches to urban development; urban communities in the Third World and their problems. Prerequisite: Soc 126 or permission of the instructor. (Spring)

129 **Race and Minority Groups** (3) Staff
Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice. (Spring)

130 **Class, Status, and Power** (3) Stephens
Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies which affect these distributions. (Fall)

132 **The Family in Modern Society** (3) Stephens
An examination of the stages of family life: birth, childhood, premarital relationships, marriage and sex roles in marriage, retirement and old age. Special emphasis on development and maintenance of interpersonal relations.

133 **Sociology of Education** (3) Wallace, Tropea
Analysis of educational systems from institutional perspectives and as agencies of socialization; relationships of education in general to

society, including technological, communal, and subcultural components. (Spring)

135 **Youth and Delinquency** (3) Courtless, Tropea

Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control. (Spring)

136 **Criminology** (3) Tropea, Courtless

Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society. (Fall)

137 **Sociology of Law** (3) Courtless, Tropea

Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law. (Fall)

139 **Deviance and Control** (3) Tropea, Courtless

Analysis of the development of primary deviance through processes of socialization; analysis of the creation of secondary deviance through collective definitions and responses, within varying historical, political, and social contexts. (Spring)

140–41 **Social Research Methods** (3–3) Cisin, Dietz

Soc 140: introduction to basic research methods in sociology. Soc 141: advanced research methods. Prerequisite to Soc 141: Soc 140. (Academic year)

143 **Social Movements** (3) Stephens

General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions. (Spring)

149 **Modern Sociological Theory** (3) Wallace, Lengermann

Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101. (Spring)

151 **Problems of Urban Social Systems** (9) Staff

Developing a comprehensive perspective on selected social problems through lectures and readings. Topic changes each semester. Prerequisite: 24 semester hours selected from economics, history, political science, psychology, and sociology. Admission by permission of instructor. (Fall and spring)

152 **Problems of Urban Social Systems—Supervised Field Work** (6) Staff

Accompanies Soc 151. A maximum of 24 hours a week will be spent in service-research efforts by placement in the Washington, D.C., area. (Fall and spring)

153 **Poverty in America** (3) Staff

Interdepartmental course offered by the Departments of Sociology and Economics. Exploration of social and economic causes of poverty in the United States and evaluation of anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts be-

tween sociological and economic models of behavior of low-income groups.

155 **Gender Roles and Socialization** (3) Wallace
The roles of women and men from social structural and social psychological perspectives. Analysis of gender roles in the work force, gender control in social structures, and how gender roles influence personal identity.

160 **Death and Dying: A Sociological Perspective** (3) Staff
Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care, abortion, murder, funeral customs, genocide, and the depiction of death in literature and philosophy. (Spring)

181 **Major Social Processes** (3) Staff
Analysis and examination of various processes in society of general importance to the field of sociology, e.g., social conflict, socialization, social change, etc. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. A laboratory fee of $5 may be charged. (Fall and spring)

191 **Current Emphases in Sociology** (3) Staff
Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall and spring)

195 **Research** (1, 2, or 3) Staff
Independent study and special projects. Open only to selected undergraduate students with promising academic records. Before students are permitted to register for Soc 195, they must submit a written proposal of their plan of study for the approval of the staff member of the department who will be directing their research. (Fall and spring)

Third Group

203 **Social Organization** (3) Wallace, Brown
Introduction to sociological concepts and perspectives. An examination of empirical studies which utilize different theoretical perspectives. Recommended for students offering sociology as a supporting field. (Fall)

204 **Overview of the Research Process** (3) Cisin
Recommended for students who lack undergraduate preparation or recent study in the methodology of social research, and for students offering sociology as a supporting field. Not open to graduate students in sociology except as a deficiency course. (Spring)

210 **Theoretical Foundations of Political Sociology** (3) Lengermann
Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change. (Fall)

220 **Seminar: Sociology of Religion** (3) Wallace, Yeide
Analysis of theoretical and empirical approaches to the study of religion as a social phenomenon. Both classical and contemporary contributions will be examined. Among the topics to be considered

are secularization, new religious movements, and modes of religious organization. (Spring, even years)

225 **Theories of Social Change** (3) Lengermann

Review of sociological writings on modernity—its emergence in the North Atlantic societies, its consequences for third world societies, and its future. (Spring)

226 **Comparative Social Development** (3) Frey

Analysis of major issues in the sociology of development, urbanization, and modernization. Among the issues to be considered are political development, education, sex roles, urban growth, family welfare and change, and public administration. (Fall)

230 **Sociological Research Methods** (3) Cisin

Systematic survey of sociological research strategies and review of the literature in this area. Recommended for students with only one undergraduate course in research techniques. Prerequisite: Stat 105 or equivalent. (Fall)

231 **Seminar: Advanced Research Methods** (3) Cisin

Intensive study and evaluation of a few sophisticated research techniques and of new developments in the methodology of social research. Prerequisite: Soc 230, Stat 105, or equivalent. (Spring)

232 **Qualitative Methodology: Doing Field Research** (3) Stewart, Wallace

Practical application of data collection methods in natural settings; observation, participant observation, and field experience. Emphasis on implementing research projects using these methods for purposes of developing empirically grounded theory.

235 **Seminar: Sociology of Education** (3) Wallace, Tropea

Sociological theories on relationships between education and the economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years)

238 **Seminar: Development of Sociological Theory** (3) Lengermann

Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall)

239 **Seminar: Modern Sociological Theory** (3) Lengermann, Wallace

Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring)

240 **Sociology of Work and Occupations** (3) Stewart

Review of major theoretical and empirical developments in industrial sociology; varying approaches to the study of work and occupations. (Fall)

241 **Sociology of Work and Organizations** (3) Stewart

Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision-making, recruitment, allocation of authority, informal organization, and interorganizational relations. (Spring)

242 **Seminar: Medical Sociology** (3) Stewar
Sociological analysis of cultural, social, and social-psychologica factors in occurrence and care of physical and mental illness a they function in the community, the hospital, and in interperson relations; study of the social structure of health care services an interplay of the various health professions. (Spring)

252 **Seminar: Sociology and Social Policy** (3) Fre
Concepts, theory and research which demonstrate the applicabilit of a sociological perspective (for example, views on social system roles, formal organization, power, stratification, decision-makin social values) to the policy process. (Fall)

254 **Seminar: Methods in Social Policy Research** (3) Fre
Offered jointly by the Educational Policy and Sociology Department Systematic survey of conceptualization, design, and practice of evalu ation research of social experiments, and of simulation and techno logical forecasting. Prerequisite: Stat 105, Soc 230, 252; or permissio of instructor. (Spring) Staf

256 **Selected Topics in Social Policy Analysis** (3)
A sociological perspective on selected policy areas, including urba planning, education, family, aging, health, affirmative action, law en forcement, and economic development. Particular policy areas wi be rotated year by year. Course may be repeated for credit.

*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) Courtless, Trope
Same as Law 475(2). (Fall)

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) Courtless, Trope
Same as Law 476(2). (Spring)

263 **Seminar: Law and Society** (3) Courtless
Selected problems in law as an instrument of social policy; emphas on the organization of legal decision-making processes. (Summe

265 **Selected Topics in Criminal and Juvenile Justice Policy** (3) Courtless, Trope
Development of a systematic perspective on policies affecting ju juvenile and criminal justice systems. Topics will include adjudica tion, disposition, diversion, and sentencing. (Spring, even years) Bro

280 **The Sociology of Aging** (3)
Impact of current demographic changes (size and composition of th aged population) on the existing structure of American society (Spring) Bro

281 **Problems of Growing Old in American Society** (3)
Analysis of the bases of the social status of the aged in Americ society, the impact on older people of characteristic situation changes in later life, and societal responses to those impact an defined as social problems. (Fall)

* Students registering for Soc 259 or 261 make special arrangements with the instructor supplementary assignments equivalent to one additional semester hour. For description of courses, see the *National Law Center Bulletin*.

290 **Principles of Demography** (3) Staff

An interdepartmental course offered by the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) Staff

An interdepartmental course offered by the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Research** (arr.) Staff

Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring)

99–300 **Thesis Research** (3–3) Staff

(Fall and spring)

urth Group

332 **Seminar: Processes of Inquiry** (3) Staff

Development and critical review of students' research projects with the objectives of aiding conceptualization and developing research design. Consideration of the interplay between theory and methods. Prerequisite: at least three semester hours each of graduate theory and graduate methods. May be repeated for credit.

351 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topics will be offered as the demand requires each fall semester: (1) *Social Research*—causal inference in social research, evaluation research, philosophy of science, etc.; (2) *Sociology of Work*—work and public bureaucracies, industrial sociology, etc.

352 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topics will be offered as the demand requires each spring semester: (1) *Sociological Theory*—study of important theorists such as Marx, Weber, Parsons; important themes such as social change, social control; important schools such as symbolic interactionism, general systems theory; (2) *Law and Society*—the sociology of law, theories of deviance, and related topics.

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SPANISH

See **Romance Languages and Literatures.**

SPECIAL EDUCATION

Professors R.S. Cottrell, Jr., R.K. Ives *(Chairman)*, J.R. Shotel
Associate Professors M.S. Castleberry, L.A. Tsantis, N.J. Sobel
Assistant Professors N.D. Tiscione, R.N. Ianacone, A.J. Mazur, A.E.C. Hunter, J.R. Snider *(Visiting)*
Assistant Professorial Lecturer H. Novakovitch
Instructor M.B. Freund *(Research)*

Programs of study in special education leading to the degrees of Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, and Doctor of Education are offered by the School of Education and Human Development (see pages 104–35).

Second Group

Mazur

101 Dimensions of the Complementary Teaching Role: Implementation of the Resource Room (3)
Instructional experiences designed to refine the insights and competencies essential for successful operation of the complementary teaching model. (Fall)

Mazur

102 Practicum: Teaching the Child with Special Needs: Methods and Materials (3)
Laboratory course taught in an elementary public school. Students observe and participate in a demonstration seminar conducted by the instructor. Must be taken concurrently with SpEd 189. (Fall)

Mazur

103 Practicum: Teaching the Child with Special Needs: Creative Programming (3)
Continuation of SpEd 102. Concentration on the total programming of the child with special needs. Must be taken concurrently with SpEd 190. (Spring)

Mazur

160 Academic and Psychosocial Assessment of the Elementary-School-Aged Exceptional Child (3)
An investigation of the assessment process: theory and scope of psycho-educational assessment, informal and formal assessment, clinical experience in informal assessment, application of diagnostic findings to instructional recommendations.

Staff

168 Overview of Handicapping Conditions: Etiology and Symptomatology (3)
Causes and symptoms of most prevalent handicapping conditions in the mainstreamable child.

Mazur

170 Dynamics of Human Relations: Theory and Practice (3)
(Formerly Interpersonal/Intrapersonal Relationships for Special Education Teachers)
Consideration of factors leading to successful interaction with children. (Fall)

187 **Introduction to Sign Language and Deafness** (3) Staff

Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 187 and HKLS 187.

188 **Sign Language and Deafness** (3) Staff

A second course in conversational expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 188 and HKLS 188.

189 **Preprofessional Internship: Program Adaptation for the Special Needs Child in the Regular Classroom** (3) Staff

Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)

190 **Preprofessional Practicum: Inspecting a Continuum of Special Education Services** (3) Staff

Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with SpEd 103. (Spring)

197–98 **Special Study in Special Education** (3–3) Staff

Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

199 **Practicum in Complementary Teaching** (6) Mazur

Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Spring)

200 **Psychosocial Development of Young Exceptional Children** (3) Tiscione

The relationship between psychosocial development of the exceptional child and psychosocial development in general. Admission by permission of instructor. (Fall, alternate years)

ird Group

201 **Introduction to Special Education** (3) Botwin

Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accomodate children in a school program. (Fall)

220 **Selected Topics in Special Education** (3) Staff

Courses on topics relevant to special educators offered to selected groups.

222 **Special Education in the Regular Secondary Classroom: Legislative Issues and Concerns** (3) Staff

Issues relating to interpreting and monitoring compliance with legislation addressing the needs of the handicapped in secondary schools. Emphasis on practical strategies in response to the mandates of P.L. 94–142, P.L. 94–482, and P.L. 93–112.

230 **Vocational/Special Education Assessment of the Secondary Level Handicapped Student** (6) Ianacone, Hunte

Individual study of methods and materials used in vocational assess ment including formal and informal tests to determine vocational interests and aptitudes, academic performance, learning style an behavioral readiness. (Fall) Staff

231 **Selected Vocational/Special Education Methods and Materials** (3)

Selected materials and techniques used in teaching and programming for the secondary school level handicapped person in academic career, leisure, and occupational skill areas. (Fall)

232 **Practicum: Vocational/Special Education** (3) Ianacone, Hunte

Placement in at least three to five different sites offering programs in the areas of pre-vocational, industrial arts, and vocational pro gramming that serve the adolescent student. (Fall) Staff

233 **Curriculum for Vocational/Special Education** (3)

Examples and practice in designing and implementing academic, self- help, career education, pre-vocational, industrial arts, and vocational curriculum skills for the handicapped. (Fall) Staff

234 **Seminar in Vocational/Special Education** (3)

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship with handicapped adolescents. Must be taken concurrently with SpEd 295. (Spring) Staff

235 **Coordination of Job Placement Programs in Vocational/Special Education** (3)

Rationale and resources used when developing and coordinating job placement programs for adolescents with handicaps. (Spring) Staff

236 **Secondary Career Planning for the Handicapped** (3)

Legislative issues and the on-going process of career decision mak ing by the handicapped person who is completing a secondary school level program. (Summer)

260 **Developmental Assessment of Young Exceptional Children** (3) Shotel, Tsantis, Tiscione, Sobel

Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor. (Fall)

261 **Practicum: Methods and Materials for Young Exceptional Children** (6) Ives, Tsantis, Castleberry, Shotel, Sobel

Clinical practice in design and implementation of educational strate gies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requires eight hours a week in service. (Fall)

262 **Seminar: the Education of Young Exceptional Children** (3) Sobel, Tsantis, Tiscione, and Staff

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship for the education of young ex ceptional children. Must be taken concurrently with SpEd 292. Per mission by permission of instructor. (Spring)

263 **The Severely and Profoundly Handicapped Child: Development and Etiology** (3) — Staff

Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience. (Fall)

264 **The Severely and Profoundly Handicapped Child: Methods and Techniques** (3) — Staff

Specialized programs, techniques, and methods for teaching children with severe disabilities. (Spring, even years)

265 **Clinical Experience with Multiply Handicapped and Developmentally Disabled Young Children** (3) — Ives, Castleberry

Preliminary field experience designed for students with limited experience in early childhood special education. Supervised experience necessary for program articulation. Three-week intensive involvement in an early childhood special education setting. (Summer)

266 **The Development of Language in Young Exceptional Children** (3) — Staff

Introduction to the study of language acquisition and the application of current research on language of handicapped children. (Fall)

267 **The Early Childhood Special Educator: A Survey of Roles and Services** (3) — Tsantis, Freund

Examination of the spectrum of roles available in early childhood special education; emphasis on the historical, legal, and philosophical aspects of early childhood special education. (Spring)

268 **The Development of Young Exceptional Children with Emphasis on Handicapping Conditions** (3) — Sobel, Freund, Tiscione

Lecture (2 hours), site visitation (3 hours), discussion (1 hour). (Fall)

269 **Multidisciplinary Theory in Special Education** (3) — Castleberry, Sobel, Tiscione

Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal/intrapersonal relationships. (Fall)

270 **Mainstreaming: Adapting Attitudes, Programs, and Curriculum to Meet the Needs of the Special Child** (3) — Staff

Review of the basic curriculum areas as they relate to the development of readiness skills in special education. (Spring, alternate years)

271 **The Interdisciplinary Approach to Planning for the Exceptional Child: Theory and Practice** (3 to 6) — Freund

Theory of, and field experience in, interdisciplinary team functioning.

273 **Seminar for Special Education Strategist Intern** (3 or 6) — Ives, Castleberry, Shotel

Weekly seminar dealing with experiences, problems, and concerns encountered during special education/early childhood strategist internship. Concurrent enrollment in SpEd 293 required. (Spring)

290 **Control and Management Techniques for the Young Exceptional Child** (3) Tiscione, Sobe
Examination of the theory, techniques, and tools essential for e fective classroom management. Admission by permission of in structor. (Spring)

292 **Professional Internship in Education of Young Exceptional Children** (6 or 9) Sobel, Tsantis, Tiscione Freund, and Staf
Supervised internship in the education of young exceptional chil dren. A minimum of 420 clock hours required. Must be taken con currently with SpEd 262. (Spring and summer)

293 **Professional Internship for the Special Education/Early Childhood Strategist** (6 to 9) Ives, Castleberry Shote
Supervised internship in strategist role, emphasizing diversified multi-dimensional aspects of a special education/early childhood program. A minimum of 420 clock hours is required. Concurrent en rollment in SpEd 273 required. (Spring)

295 **Professional Internship in Vocational/Special Education** (6 to 9) Ianacone, Hunter
Supervised internship in the vocational/special education of ado lescent handicapped youth, emphasizing the diversified, multi-dimen sional, and inter-agency cooperative needs for such programming. A minimum of 420 clock hours is required. Must be taken concurrently with SpEd 234. (Spring)

296 **Philosophical, Legal, and Practical Issues in the Implementation of Public Law 94-142** (3)
Historical and legal perspectives that have led to Public Law 94-142 The Education for All Handicapped Children Act of 1975, and the consequences of this act on public school service delivery systems Emphasis on the present and future impact of this law and its in terpretation on the regular class teacher and administrator and on their roles within a public school system. Staf

297–98 **Individual Study in Special Education** (1 to 3 each)
Individual study or research under guidance of staff member. Pro gram and conferences arranged with advisor. Admission by permis sion of advisor. May be repeated for credit. (Academic year)

303 **Administration and Supervision of Special Education** (3) Betw
Philosophy and nature of special education; program organization administration, and development. Surveying local needs; program evaluation and supervision. Admission by permission of instructor (Spring)

304 **Recent Research and Trends in Special Education** (3) Cottr
Emphasis on research methodology and considerations. The unique problems of doing research in special education. Procedures and sources for obtaining research funding. Admission by permission of instructor. (Fall)

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3) Sobel, Tiscione, and St
Theoretical foundations and clinical techniques necessary for early childhood special educator to successfully counsel parents handicapped children. (Spring)

308 **Instructional Processes in Special Education: The Trainer of Trainers** (3)

Review of the instructional processes as they affect education and special education, including the university and staff development perspective; opportunities for practice in needs assessment, program design and actual instruction. Admission by permission of instructor. (Spring)

343 **Psychoeducational Diagnosis of Children with Behavior or Learning Difficulties** (3) Tsantis, Tiscione

Lecture and laboratory course designed to develop educational strategies for children who present behavior or learning problems in the schools. Admission by permission of instructor. (Fall)

345 **Consultation Skills in Special Education** (3) Shotel

Consultation models from organizational development, organizational psychology, and mental health applied to in-service training for educational personnel and facilitating appropriate programs for the special child in the public schools. (Spring)

350 **Child Identification and Assessment: The Process of Planning Appropriate Educational Intervention** (3) Staff

Exposes administrators/supervisors to information relative to the exceptional child. Examines etiologies and symptomologies of handicapping conditions, developmental norms, identification and assessment strategies, and individualized educational programming.

351 **Seminar: Developing School/Community Support Systems—Models for Effective Service Delivery** (3) Staff

Provides experiences that facilitate effective service planning for the handicapped child through the examination of existing models of family intervention, curriculum adjustment, and special education service delivery.

352 **Seminar: Legal Issues and Public Policy Concerns in Planning Service Access for the Special Child** (3) Staff

Allows administrators/supervisors to review the responsibilities of their existing roles with regard to requirements generated by the legislative and judicial branches of the government.

360 **Interdisciplinary Techniques in the Diagnostic Process** (3) Tiscione, Tsantis

Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent. (Summer)

370 **Attitude Change and the Access Process for the Special Child: Individual Ability to Change** (3) Ives

Applies specific psycho/social constructs germane to successful human interaction to the professional milieu of the special education consultant/administrator. (Fall)

Fourth Group

401 **Doctoral Mini-Seminar in Special Education** (3) Staff

Participation in a small group with a selected faculty member; in-

tensive study and discussion of an area of common interest in an informal environment providing for the exchange of ideas and optimum potential for personal and professional growth. Admission by permission of instructor. (Fall) Staff

453–54 **Doctoral Internship: Special Education** (6–6)
Supervised professional internship in college teaching, administration, supervision, or private agency function. Each internship individually arranged. Admission by permission of advisor. (Academic year) Shotel

480 **Evaluation in Special Education** (3)
Application of educational evaluation models to special education situations. Special consideration given to the work of Haines, Popham, Scriven, Stake, Stufflebeam, Taba, and Tyler. Practical application of the theoretical models will be stressed. (Fall) Shotel

490 **Departmental Seminar in Special Education** (3)
Provides an opportunity for selected graduate students to develop, refine, and demonstrate their skills and abilities in a small-group setting with fellow students and department faculty. Admission by permission of instructor. (Spring) Staff

491 **Dissertation Research** (arr.) Staff

Fifth Group

701 **Experimental Course** (3) Staff

721 **Experimental Course—Interdepartmental** (3) Staff

SPEECH AND DRAMA

Professors J.W. Hillis *(Director of Speech-Language Pathology and Audiology)*, L.S. Bowling *(Chairman)*, W.M. Reynolds *(Director of Speech Communication)*, L.S. Bielski
Professorial Lecturer G. Herer
Associate Professors M.D.M. Brewer, J.R. Regnell, C.W. Linebaugh, M.S. Kernan, J.E. Thiel
Assistant Professors N.C. Garner, S. Keller *(Director of Forensics)*, B.W. Sabelli, A.G. Wade, L.B. Jacobson *(Acting Director of Drama)*, W.A. Pucilowsky, B.R. Williams
Assistant Professorial Lecturers L.B. Beck, S.L. Murray, J.D. Schafer

Bachelor of Arts with a major in dramatic art (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—24 semester hours of second-group courses outside the Department of Speech and Drama as approved by the major advisor. (Courses in dramatic literature offered in the classics, English, and foreign language departments are strongly recommended.)
4. Required courses in the major—SpDr 114, 151, 152 or 195, 165–66; 9 additional semester hours in second-group drama courses.

*Bachelor of Arts with a major in radio-television (departmental)**—The following requirements must be fulfilled:

1. The general requirements, as stated on pages 74, 81–87. Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—18 semester hours in a single subject area outside the Speech and Drama Department as approved by the major advisor.
4. Required courses in the major—SpDr 49 or 110, 75, 133, 134, 137 or 138, and 145. Twelve hours of second-group courses chosen from the areas of radio-television and film studies, and/or from speech communication, drama, and speech pathology/audiology as approved by the major advisor.

Bachelor of Arts with a major in speech communication (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—12 semester hours in psychology and/or philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Speech and Drama as approved by the major advisor.
4. Required courses in the major—SpDr 112, 121, 126; 15 additional semester hours of second-group courses in the Speech and Drama Department as approved by the major advisor.

Bachelor of Arts with a non-professional major in speech-language pathology and audiology (departmental)—The following requirements must be fulfilled:

1. The general requirements, as stated on pages 74, 81–87. Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—Psyc 115, 121 and 131 (or their equivalent), plus 15 additional semester hours of second-group courses selected from related areas as approved by the major advisor.
4. Required courses in the major—SpDr 101, 103, 104, 108, 118, 119; six additional semester hours of courses in the Department of Speech and Drama as approved by the major advisor.

Master of Arts in the field of speech-language pathology and audiology—Prerequisite: the degree of Bachelor of Arts with a major in speech-language pathology and audiology from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examination. Required: the general requirements, pages 91–99. The program of study consists of 36 semester hours of approved course work without a thesis, or with the approval of the department, 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). All students must satisfy the academic and supervised practicum requirements of the Certificate of Clinical Competence awarded by the American Speech-Language-Hearing Association.

*Admission to this major may be on a selective or space-available basis.

All students must take the National Examination in Audiology or in Speech Pathology available through the Educational Testing Service. Students must request the Testing Service to send copies of the test scores to the department of speech and drama to be used in the fulfillment of the general requirement in the Graduate School of Arts and Sciences for the Master's Comprehensive Examination. Satisfactory test results must reach the department at least three weeks before graduation.

Master of Fine Arts in the field of dramatic art—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. The program of study consists of (1) 30 semester hours of second- and third-group course work planned in consultation with the advisor; (2) a creative thesis (equivalent to six additional semester hours) in the selected area of concentration. Each candidate is expected to complete the program in residence in four continuous academic-year semesters.

Bachelor of Arts in Education and Human Development with a teaching field in speech and drama—Prerequisite: the education curriculum, pages 114–15.

Required: the speech and drama option and the professional courses listed on page 119.

Speech and Hearing Therapy: See Speech and Hearing Clinic, page 54.

First Group

1 Communicative Speaking and Listening (3) Reynolds and Staff

Basic theories and principles of public speaking: research, composition, delivery, and criticism. Recording fee, $5. (Fall and spring)

2 Interpersonal Communication (3) Reynolds

Introduction to the role of verbal and nonverbal transactions in spontaneous, face-to-face encounters. Role-playing, models, and simulations. (Summer)

11 Voice and Diction (3) Bielski and Wade

Development of naturalness, correctness, and clarity in conversation through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee, $5. (Fall and spring)

45 Understanding the Theater (3) Sabelli

The art of the theater; its literature, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussion. Attendance at theatrical performances and presentations by visiting artists. Primarily for non-majors. (Fall and spring)

49 Rhetoric in Political and Social Action (3) Keller

Study of the use and abuse of rhetoric in contemporary political and social movements. Theories of persuasion and agitation, as well as means of support considered in various case studies including civil rights, anti-Vietnam protests, and women's rights. (Fall)

75 Sight and Sound (3) Thie

Development of a critical awareness of auditory and visual communication through an introduction to the techniques and aesthetics

of audio-visual media. Lecture (2½ hours), laboratory (2 hours). Prerequisite: permission of instructor. Laboratory fee, $10. (Fall and spring)

Second Group

101 Bioacoustics (3) Brewer

Acoustic analysis of speech and the physiology of reception and processing of speech by the human auditory system. Prerequisite: BiSc 3–4 or 11–12 or equivalent; Psyc 1 or 5 or 6 or equivalent. (Fall)

103 Biophonetics (3) Linebaugh

Biological bases of speech-language production. Emphasis on the function of the nervous system, the respiratory system, and the vocal and articulatory mechanisms in the production of intelligible speech. Prerequisite: BiSc 3–4 or 11–12 or equivalent; Psyc 1, 5, or 6, or equivalent. (Fall)

104 Introduction to Speech-Language Pathology (3) Regnell

Survey of the field of speech-language pathology. The effect of body-system pathologies and environmental factors on the production of speech and language. Prerequisite: SpDr 103. (Spring)

105–6 The Writing of Plays (3–3) Claeyssens

Same as Engl 105–6. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration.

108 Introduction to Audiology (3) Brewer

Survey of the field of audiology. The effect of body-system pathologies on the reception of speech and other acoustic stimuli. Procedures of pure-tone and speech audiometry. Clinical and educational services for the hearing impaired. Prerequisite: SpDr 101. (Spring)

110 Interpretation (3) Wade

The study of literature through performance. Interpretation of prose, poetry, and drama. (Fall and spring)

111 Business and Professional Speaking (3) Reynolds

Study of the communication process in business and professional organizations; practice in interviewing, preparation and delivery of technical reports, salesmanship, and speeches for special occasions. Primarily for nonmajors. (Fall)

112 Persuasion (3) Keller

In-depth study of the principles and techniques of persuasion focusing on theory and practice. Emphasis is placed on the common-premise model while considering factors of image, support materials, emotion, audience analysis, and style. Prerequisite: SpDr 1 or permission of instructor. (Spring)

113 Voice for the Theater (3) Jacobson

The practice and application of voice production in four areas: skeletal alignment, breathing, resonance, and articulation. Emphasis is placed on individual awareness of the process of voice production and its application to dramatic texts. Prerequisite: SpDr 11 and permission of instructor. (Fall)

114 Introduction to Acting (3) Jacobson
For non-dramatic art majors. Introduction to the principles of acting for stage and television. Practice in scene work and on-camera performance. (Fall, even years; spring, odd years)

115 Acting I (3) Garner
Basic techniques of concentration, imagination, and character analysis. Concurrent registration in HKLS 115 required. Prerequisite: SpDr 114. (Fall)

116 Acting II (3) Garner
Principles of role development. Scene study, principally in 20th century realism. Concurrent registration in HKLS 116 required. Admission by audition. Prerequisite: SpDr 114. (Spring)

117 Audition Techniques (1)
The course examines all aspects of the audition process: selection and rehearsal of audition monologues, handling of cold reading, etc. Prerequisite: SpDr 114 or the equivalent. (Spring)

118 Structural Analysis of Speech and Language (3) Staff
Development of skills in the phonetic/phonemic transcription and syntactic analysis of oral language samples. Prerequisite: Psyc 115 or equivalent. (Spring)

119 Clinical Procedures for Communication Disorders (3) Hillis
Development of skill in precision treatment techniques for communication disorders. Emphasis on accountability of providers of clinical and educational services for the communicatively handicapped. Prerequisite: Psyc 121 and 131, or equivalent, and permission of instructor. (Fall)

120 Advanced Study of Clinical Procedures for Communicative Disorders (1 to 3) Hillis
Seminar on problems encountered in clinical practice for remediation of communicative disorders. Staffings of active case material from clinical and educational settings. Development of hardware and software programming skills for treatment of communicative disorders. Term project required for graduate students. Concurrent clinical or educational placement required. Prerequisite: SpDr 119 or equivalent. (Spring)

121 Group Discussion and Conference Leadership (3) Reynolds
Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SpDr 1 or permission of instructor. (Fall and spring)

126 Argumentation and Debate (3) Reynolds
Study of the advocacy system; special emphasis on issue identification, use of evidence, and logical proof. Extensive practice in argumentative speaking. Prerequisite: SpDr 1 or permission of instructor. (Spring)

127–28 Forensic Practice (1–1) Keller and Wade
Student participation in intercollegiate speech activities. May be repeated for a total of four semester hours of credit. Admission by permission of instructor. (Fall and spring)

129 **TV News: The Politics of Visibility** (3) Staff

Joint offering of the Departments of Political Science, Journalism, and Speech and Drama. Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. (Fall and spring)

132 **Radio-Television Performance** (3) Staff

Introduction to the basic theories and techniques required for effective, non-dramatic media performance (i.e., announcing, moderating, newscasting, etc.). Prerequisite: SpDr 1, 11, or 110, and permission of instructor. (Spring)

133 **Broadcasting in America** (3) Thiel

Study of the origins, structure, and nature of American broadcasting. (Fall)

134 **Radio Production** (3) Williams

Introduction to the basic concepts of radio as a communication medium; emphasis on the design and production technique of a variety of radio programs. Lecture (2½ hours), laboratory (2 hours). Prerequisite: SpDr 75 (for radio-television majors), and permission of instructor. Laboratory fee, $10. (Fall and spring)

135–36 **Radio Workshop** (1–1) Williams

Theory and practice in radio station operations. Admission by permission of instructor, after one semester of satisfactory participation in WRGW activities. May be repeated for a total of four semester hours of credit. (Academic year)

137 **Scriptwriting** (3) Thiel

Study and practice of the forms, techniques, and types of writing for radio, television, and film. Prerequisite: Engl 11 or 12, and SpDr 75 (for radio-television majors), and permission of instructor. (Spring, odd years)

138 **Scriptwriting: Selected Topics** (3) Wade

Intensive study and practice of a specific genre of radio, television, and film writing. Topics may include adapting the literary text, series and serials, and anthology drama. Prerequisite: Engl 11 or 12, SpDr 75 (for radio-television majors), and permission of instructor. (Spring, even years)

141 **Negotiations and Conflict Resolution** (3) Keller

Communications factors involved in negotiation and conflict resolution. Use of models and simulations to explore prominent-solution approach to conflict situations. (Summer)

143 **Origins of Contemporary Rhetorical Theory** (3) Reynolds

Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years)

144 **History and Criticism of American Public Address** (3) Reynolds

Study of American oratory from its pre-Revolution origins to the present day, interpreted in terms of issues and movements. (Spring, odd years)

Thiel

145 Introduction to Television Production (3)

Basic course in television production techniques and skills. Directing, script-writing, graphics, and other aspects of television production. Extensive practice in working television equipment; emphasis on various in-studio projects. Lecture (2 hours), laboratory (2½ hours). Prerequisite: SpDr 134 and permission of instructor. Laboratory fee, $10. (Fall)

Thiel

146 Television Directing (3)

Advanced study and practice of television directing techniques. Students are expected to demonstrate skill in working with studio and electronic field production equipment and in the development of television programs from original concepts to final productions. Lecture (2 hours), laboratory (3 hours). Prerequisite: SpDr 145 and permission of instructor. Laboratory fee, $10. (Spring)

Staff

147 Innovations in Television Communication (3)

Utilization of television technology for non-broadcast purposes (i.e., corporate, medical, legal, therapeutic, artistic, and educational). Prerequisite: SpDr 133 and 145. (Fall)

Staff

148 Television Production (3)

Advanced production techniques, with emphasis on the creative and executive aspects of the producer's role. Lecture (2 hours), laboratory (3 hours). Prerequisite: SpDr 146 and permission of instructor. Laboratory fee, $10. (Fall)

Thiel

149 Communicative Effects of Broadcast Programming (3)

Theories and research pertaining to issues, controversies, and problems of cultural conditioning in American broadcast programming. Prerequisite: SpDr 133 or permission of instructor. (Spring)

Pucilowsky

151 Stagecraft (3)

Lecture (2 hours), laboratory (1 hour). Theories and practicum in construction, rigging, and scene painting. (Fall and spring)

Staff

152 Advanced Stagecraft (3)

Lecture (2 hours), laboratory (1 hour). Theories and practicum in the fundamentals of lighting and sound for the theater and television. (Fall and spring)

Garner

154 Directing (3)

Fundamentals of script analysis, casting and rehearsal techniques. Prerequisite: permission of instructor. Laboratory fee, $10. (Fall)

Sabelli

155 Properties Design (1)

Theory and practicum in execution of stage props and set decoration including thermoplastics sculpture. (Fall, even years)

Sabelli

156 Make-Up Design (1)

Theory and practicum in the art of make-up design, including prosthesis, mask making, laytex. (Spring, odd years)

Sabelli

157 Stage Management (1)

(Formerly SpDr 158)

Fundamental study of stage management with emphasis on practical production work, as well as theory. (Fall, odd years)

158 **Theater Architecture** (1) Sabelli
(Formerly SpDr 159)
Study of general principles, theories, and styles of theater architecture. (Spring, even years)

163 **Musical Theater** (6) Sabelli and Jacobson
Growth of American musical theater. Development of all its components: libretto, dance, composition, lyrics, and the overall fabric of production. (Summer)

165–66 **History of the Theater** (3–3) Jacobson
An examination of the development and growth of the theater from its beginnings to the present. SpDr 165: Greek through Restoration. SpDr 166: the 18th century to the present. (Academic year 1979-80 and alternate years)

171 **Language of Cinema** (3) Staff
Introduction to cinema as language through analysis of the components of film structure—camera, editing, sound, movement, music, dialogue and mise-en-scéne. Admission by permission of instructor. (Fall)

172 **Film Directors and Styles** (3) Staff
Examination of influence on major film directors of twentieth-century art movements: German expressionism, Soviet constructivism, surrealism, neo-realism and structuralism. Comparison of film narrative with styles in dramatic and visual art forms. Prerequisite: SpDr 173 or 192. (Fall)

173 **History of Cinema** (3) Staff
Joint offering of the Art and Speech and Drama Departments. An examination of motion picture history in terms of socially structured narrative from Griffith to Godard. (Fall)

174 **Special Studies in Film** (3) Staff
An intensive study of film structure as exemplified by the work of a single director or film genre. Prerequisite: SpDr 173 or 192, and permission of instructor. (Spring)

175 **The Political Image** (3) Staff
An analysis of the techniques of propaganda and rhetoric used in film and television to visualize political ideology. Admission by permission of instructor. (Spring, even years)

176 **Film as Fact and Fiction** (3) Staff
A comparison of structural differences between documentary and fiction film in order to study how each presents different versions of reality. Admission by permission of instructor. (Spring, odd years)

192 **The American Cinema** (3) Staff
Joint offering of the Speech and Drama Department and the American Studies Program. History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. (Spring)

193 **Scene Design** (3) Staff
Fundamental study of scenography, including drafting, rendering and model construction. (Fall)

195 **Costume History and Construction** (3) Pucilowsky
History of fashion in Western civilization from ancient Egypt to the present. Study of basic design principles. Laboratory work in costume construction. (Fall)

196 **Independent Study** (1 to 6) Staff
Independent research and special projects. Open only to undergraduate students in their senior year. Before students are permitted to register for SpDr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.

Third Group

SpDr 268–290 and 295 are for Master of Arts candidates in the field of speech-language pathology and audiology; other students may be admitted by permission of the department.

213 **Special Problems in Speech for the Actor** (3) Jacobson
An advanced study of vocal production and interpretation for the actor. The work will focus on stage dialects, and the articulation and interpretation of Shakespeare's plays. Prerequisite: SpDr 113. (Spring)

215–16 **Acting: Scene Study** (3–3) Jacobson
Scene work in modern, classic, and other nonrealistic drama. Admission by audition. Both courses may be repeated once for credit. Recording fee, $4. (Academic year)

250 **Advanced Scene Design** (3) Sabelli
Preparation for the advanced student designer, with emphasis on the individual development of rendering techniques, technical drafting, traditional script analysis, and original scenographic interpretations. (Fall)

251 **Special Projects in Scene Design** (3) Sabelli
Exploration of all styles of traditional and contemporary scenography. Admission by permission of instructor. (Spring)

252 **Advanced Costuming** (3) Pucilowsky (Spring)
Study of special design, style, and construction problems.

253 **Problems in Costume Design** (3) Pucilowsky
The study of pattern drafting and draping methods based on historical costumes through lecture and classwork. Basic millinery construction and design. Prerequisite: SpDr 195. (Spring, even years)

255 **Lighting Design** (3) Sabelli
Theory and execution of lighting design for theater and television. Prerequisite: SpDr 152. (Spring)

256 **Directing Seminar** (3) Garner
Problems in directing plays from selected periods. May be repeated for credit. (Spring)

257 **Modern Trends** (3) Staff
Study of recent developments in dramatic theory, literature, and production. (Fall, even years)

258 **Theater Management** (3) **Staff**
Theory and practice in theater management: promotion, box office, and house management. Admission by permission of instructor. (Fall, odd years)

261–62 **Theatrical Styles** (3–3) Pucilowsky
Detailed study of the culture, climate, and production techniques of significant periods of drama. Prerequisite: SpDr 165–66. (Academic year)

267 **Interdisciplinary Study of Communication Disorders** (3–6) Staff
Multidisciplinary understanding of philosophies of learning and treatment of symbolic malfunctioning. Admission by permission of instructor. (Fall and spring)

268 **Clinical Practice in Communication Disorders** (1–3) **Staff**
Supervised clinical practice in the evaluation and treatment of communication disorders. May be repeated for a total of three semester hours of credit. (Fall and spring)

269 **Community Programs in Communication Disorders** (3) Herer
Methods and procedure for the planning, management, and operation of hospital, school, and other community programs for the communicatively handicapped. (Spring)

270 **Audiological Evaluation of Children** (3) Bowling
A study of the development of the sense of hearing; underlying causes of auditory deficits and audiometric techniques used to measure hearing in children. (Summer)

271 **Developmental Disorders of Speech Production** (2) Regnell
(Formerly Evaluation of Speech Articulation Disorders)
Evaluation of persons with speech articulation disorders; test demonstrations, oral peripheral examination; special segments on evaluation and treatment of velopharyngeal dysfunction (including cleft palate) and cerebral palsy. Laboratory fee, $7.50 (Fall)

272 **Disorders of Speech Articulation** (3) Hillis
(Formerly Etiology of Speech Articulation Disorders)
Consideration of speech articulation disorders from physiologic, acoustic, perceptual, linguistic, and learning points of view. Review of treatment methods and programs. Laboratory fee, $7.50 (Spring)

273 **Language Disabilities in Children: Identification and Diagnosis** (2) Staff
(Formerly Treatment of Speech Articulation Disorders)
Review of current theoretical approaches to evaluation; a diagnostic model to facilitate evaluation and interpretation; review of available standardized tests; observation and testing experience. Laboratory fee, $7.50. (Fall)

274 **Language Disabilities in Children: Remediation** (3) Staff
(Formerly Evaluation of Fluency Disorders)
Review of current therapeutic models; use of diagnostic information for designing a remedial plan; monitoring progress; coordinating language remediation with classroom and additional resource support; experience through monitoring ongoing language remediation. Laboratory fee, $7.50. (Summer)

275 **Evaluation of Speech Fluency Disorders** (3) Hillis
(Formerly Treatment of Fluency Disorders)
Consideration of stuttering and other disorders of speech rate and rhythm, from physiological, emotional, attitudinal, behavioral, and developmental points of view. Procedures for clinical assessment. Laboratory fee, $7.50. (Fall)

276 **Treatment of Speech Fluency Disorders** (3) Hillis
(Formerly Fluency Disorders in Children)
Review of historical and current methods for treatment of stuttering and other disorders of speech rate and rhythm. Laboratory fee, $7.50. (Summer)

277 **Differential Diagnosis of Acquired Language Disorders** (2) Linebaugh
(Formerly Clinical Evaluation of Language Disorders, 3 credits)
Review of neurological substrates of language processing and widely used tests of acquired language disorders; consideration of patterns of communicative deficits related to various neuropathologies, with emphasis on their differentiating clinical features and prognosis. Laboratory fee, $7.50. (Fall)

278 **Rehabilitation of Acquired Language Disorders** (3) Linebaugh
(Formerly Applied Research in Language Disorders)
Review of the nature of acquired language disorders and factors affecting patient performance; consideration of specific treatment approaches and methods for assessing recovery and efficacy of treatment. Laboratory fee, $7.50. (Spring)

279 **Motor Speech Disorders: Differential Diagnosis and Treatment** (3) Linebaugh
(Formerly Clinical Treatment of Language Disorders in Children)
Methods of assessing motor speech disorders and their physical and acoustic characteristics; approaches to the treatment of the dysarthrias and apraxia of speech. Laboratory fee, $7.50. (Summer)

280 **Functional Voice Disorders** (3) Regnell
Review of the normal structure and function of the vocal mechanism. acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with functional voice disorders. Programs for the remediation of these voice problems will be covered. Laboratory fee, $7.50. (Fall)

281 **Organic Voice Disorders** (3) Regnell
(Formerly Alaryngeal Speech—2 credits)
Acquisition of knowledge and clinical/educational skills in providing speech evaluation and treatment for persons with organic voice disorders; special inclusion of management of laryngectomized persons. Laboratory fee, $7.50. (Spring)

283 **Aural Rehabilitation** (3) Brewer
Systems, principles, and methods of auditory training and speech reading, including development of lesson plans and their application in resolving communication problems of acoustically-handicapped individuals. Laboratory fee, $7.50. (Fall)

284 **Advanced Clinical Audiology** (3) Bowling
Principles and methods underlying assessment of auditory disorder; emphasis on bone conduction, masking, and speech intelligibility.

Clinical implications, tests; demonstration and practicum. Laboratory fee, $7.50. (Fall)

285 **Hearing Aids** (3) Brewer

Discussion of hearing-aid characteristics and electroacoustic measurements; hearing-aid effectiveness in improving communicative efficiency; procedures for selection and clinical evaluation of hearing aids; counseling of the patient. Laboratory fee, $7.50. (Spring)

286 **Special Auditory Tests** (3) Bowling

Special speech and pure tone audiometric techniques for differentiating conductive, cochlear, and retro-cochlear lesions, for identifying functional hearing losses. Clinical application of tests and interpretation of results. Laboratory fee, $7.50. (Fall)

287 **Auditory Processing** (3) Bowling

Detailed study of the factors which affect auditory perception and comprehension; methods and procedures used in identifying disorders of auditory perception and comprehension. Laboratory fee, $7.50. (Spring)

288 **Psychosocial Aspects of Hearing Loss** (3) Bowling

Consideration of the rationale and procedures for evaluating the social and emotional behavior as well as the intellectual potential of those with impaired hearing. Laboratory fee, $7.50. (Spring)

289 **Impedance Audiometry and Middle Ear Function** (3) Staff

Development of skills in impedance audiometry and audiological assessment of middle ear function. Laboratory fee, $7.50. (Fall)

290 **Management of the Hearing-impaired Child** (3) Brewer

Overall management approach to the hard-of-hearing child including diagnosis, parent counseling, amplification, educational placement, treatment programs and procedures, and re-evaluation. Laboratory fee, $7.50. (Summer)

292 **Seminar: Communicative Disorders in School Children** (arr.) Staff

(Formerly Language Intervention in the Schools)

Variable topics concerned with provision of remedial services for hearing, language, and speech handicapped school children. May be repeated for credit. Prerequisite: Permission of instructor. Laboratory fee, $7.50. (Summer)

294 **Independent Research in Dramatic Art** (arr.) Staff

May be repeated for credit. (Fall and spring)

295 **Independent Research in Speech-Language and Hearing** (arr.) Staff

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

STATISTICS

Professors H.F. Bright, S. Kullback *(Emeritus)* H.W. Lilliefors *(Chairman)*, A.D. Kirsch, J.L. Gastwirth, N. Mantel *(Research)*, D. Krueger *(Research)*, S.W. Greenhouse, N.D. Singpurwalla *(Research)*, M. Halperin *(Research)*
Professorial Lecturers J. Bailar III, J. Kullback

Associate Professors R.E. Thomas, J.M. Lachin III *(Research)*, R.R. Plaut *(Research)*
Associate Professorial Lecturers K.M. Wolter, P.P. Biemer, W. Rutiser, N.J. Kirkendall
Assistant Professors J.K. Kern, P. Thall
Assistant Professorial Lecturers T.C. Teeples, R. Jacob, R. Abbott

Bachelor of Arts or Bachelor of Science with a major in applied statistics (departmental) or mathematical statistics (departmental) or statistics with an option in computer science (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for all three majors—Math 31, 32, 33; Stat 91; Stat 97 or equivalent.

3. (a) Required course for the applied statistics major—Math 124. (Courses in computer science and some field of application are recommended. Foreign language is not required for this major.)

(b) Required courses in related areas for the mathematical statistics major —Math 124, 139, 140, 157; two years of introductory French, German or Russian, or equivalent. (Courses in computer science, mathematics, and some field of application are recommended.)

(c) Required courses for the statistics major with an option in computer science—Math 113, 124. (Foreign language is not required for this major, but it is recommended for students planning to go to graduate school.)

4. (a) Required courses in the applied statistics major—Stat 106, 110, 117, 118, 157–58, 189; plus three approved second-group courses in statistics.

(b) Required courses in the mathematical statistics major—Stat 106, 117, 118, 157–58, 189–90; plus three approved second-group courses in statistics.

(c) Required courses in the statistics major with an option in computer science—Stat 106, 110, 114, 117, 118, 157–58; plus two approved electives in mathematics and statistics.

To assure a balanced program, departmental approval of electives is required for all majors.

Students who seek Special Honors in statistics should check with the Department.

Minor in statistics—

1. General minor (with calculus): Stat 91, 117, 118, 157, 158, and 97 or 197.
2. Applied minor (without calculus): Stat 53, 105, 118, 187 or 188, and 97 or 197.
3. Computer science minor (with calculus): Stat 91, 106, 110, 114, and 198.

Master of Science in the field of applied statistics or *Master of Arts in the field of mathematical statistics*—The program of study consists of 30 semester hours of course work without a thesis. In exceptional cases the department may approve a program of study consisting of 24 semester hours of course work plus a thesis, equivalent to six additional semester hours. Candidates must pass a written Master's Comprehensive Examination and must fulfill the tool requirement by passing either a reading knowledge examination in an acceptable foreign language or an examination in computer language. For prerequisites and additional requirements, see below.

Master of Science in the field of applied statistics—Prerequisite: a bachelor's degree with a major in applied statistics from this University, or an equivalent degree. If undergraduate study did not include equivalent required courses, those courses must be taken as prerequisite to graduate study. Under certain

circumstances some prerequisites may be waived; check with the Department.

Required: the general requirements, pages 91–99, including Stat 201–2. Courses are selected in consultation with the advisor.

Master of Arts in the field of mathematical statistics—Prerequisite: a bachelor's degree with a major in mathematical statistics from this University, or an equivalent degree. If undergraduate study did not include equivalent required courses, those courses must be taken as prerequisite to graduate study. Under certain circumstances some prerequisites may be waived; check with the Department.

Required: the general requirements, pages 91–99, including Stat 201–2 and 217–18. The remaining 18 semester hours must be selected in consultation with the advisor.

Doctor of Philosophy in the field of mathematical statistics—Prerequisite: the degree of Master of Arts in the field of mathematical statistics from this University, or an equivalent degree.

Required: the general requirements, pages 91–94, 99–101. A minimum of 24 semester hours of course work must be taken in residence at this University before the General Examination may be completed. The General Examination consists of two written parts, each followed by an oral examination. Part I covers mathematics and probability and may be taken after successful completion of Stat 259–60 or 273–74. Part II may be taken after the successful completion of the remaining core courses (Stat 201–2, 217–18, 257–58, 263–64, 265–66, 287) and electives selected in consultation with the advisor. The tool requirement may be fulfilled by passing a reading knowledge examination in one foreign language and an examination in computer language.

Research Fields: Bayesian inference, biostatistics, design of experiments, information theory, multivariate analysis, nonparametric statistics, probability, robust methods, sampling, statistical inference, stochastic processes, and time series analysis.

Departmental prerequisite: One entrance unit in algebra is prerequisite to all first-group courses in statistics.

First Group

***51 Introduction to Business and Economic Statistics** (3) Bright, Kern

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, probability distributors, sampling, estimation, tests of hypotheses, regression and correlation, index numbers. (Fall and sprng)

***53 Introduction to Statistics in Social Science** (3) Staff

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

***91 Principles of Statistical Methods** (3) Lilliefors

Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

†97 Introduction to Computer Programming (3) Staff

Lecture (2 hours), laboratory (2 hours). Computer and programming concepts. High-level language programs written by students will be

* Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.

† Credit will not be given for both Stat 97 and Stat 197.

run on the University computer. Laboratory fee, $25. (Fall and spring)

Second Group

103 Sampling in Accounting (3) Bright

Special emphasis on applications of sampling techniques to business decisions and to auditing; simple and stratified samples; cluster samples; opinion polling. Prerequisite: Stat 51, 53, 91, or equivalent. (Fall and spring)

105 Statistics in the Behavioral Sciences (3) Kirsch

Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53 or equivalent, and satisfactory performance on a placement examination. (Fall and spring)

106 Introduction to Computing (3) Thomas

Development of basic computing ideas using a high-level language. Emphasis on careful design and implementation of programs using "structured programming." Prerequisite or concurrent registration: Math 31; Stat 97 or equivalent. Laboratory fee, $25. (Fall)

110 Computer Programming (3) Thomas and Staff

Lecture (2 hours), laboratory (2 hours). Computer concepts beyond the introductory level; an introduction to assembly language and advanced high-level language programming. Prerequisite: Stat 106. Laboratory fee, $25. (Spring)

***111 Business and Economic Statistics I** (3) Thomas and Gastwirth

Statistical methods appropriate for applications in economics and business. (Fall)

112 Business and Economic Statistics II (3) Thomas and Gastwirth

Continuation of Stat 111 with emphasis on techniques of regression, Chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent. (Spring)

114 Data Structures (3) Staff

Files and file systems. Basic structure of processing operations, creation updating, sorting, merging, searching, linkage, hashing. Introduction to data processing, storage, and retrieval. Emphasis on computer techniques. Prerequisite: Stat 110. Laboratory fee, $25. (Fall) Staff

117 Analysis of Variance (3)

Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance; random block, factorial, Latin square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee, $18. (Spring) Staff

118 Regression Analysis (3)

Lecture (3 hours), laboratory (1 hour). Regression and correlation theory; simple, partial, and multiple. Prerequisite: 3 semester hours selected from Stat 51, 53, 91. Laboratory fee, $18. (Fall and spring)

* Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.

119 Bases of Statistical Decision-making (arr.) Kern

For students in the Navy Graduate Financial Management Program only. Introduction to techniques of decision-making; emphasis on applications rather than theory.

123 Introduction to Econometrics (3) Staff

Joint offering of the Departments of Statistics and Economics. Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 51; Stat 111. (Fall and spring)

***127 Statistics for the Biological Sciences** (3) Greenhouse, Lachin

Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design. (Fall and spring)

131 Contingency Table Techniques (3) Staff

Analysis of multidimensional contingency tables, including estimation, tests of hypotheses, and log-linear regression. Prerequisite: Stat 118 or permission of instructor. Laboratory fee, $18. (Summer)

153–54 Mathematical Models in Population Genetics (3–3) Staff

Basic elements of genetics and cell reproduction, deterministic models of gene frequency; the Hardy-Weinberg law; effects of mutation, migration, and selection on gene frequency; multiple loci and multiple allele models; inbreeding; Fisher's fundamental theorem of natural selection; stochastic models of changes in gene frequency, including methods of direct product branching processes and diffusion equation methods.

155 Introduction to Probability (3) Staff

Probability distribution, Bayes' theorem and postulate, mathematical expectation, laws of large numbers. Prerequisite: one entrance unit in algebra.

157–58 Introduction to Mathematical Statistics (3–3) Staff

Distribution theory, sampling theory, estimation, hypothesis testing, regression analysis, experimental design. Prerequisite: differential and integral calculus. (Academic year)

159 Principles of Bayesian Statistics (3) Staff

Lecture (3 hours), laboratory (1 hour). Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: three semester hours in introductory statistics, or equivalent.

160 Mathematical Statistics for Economics Students (3) Staff

Preparation for Stat 275. (Spring)

161–62 Information Theory (3–3) Staff

Elementary development of information theory and applications to communication, coding, psychology, linguistics, etc. Prerequisite: three semester hours selected from Stat 155, 157, 159, 189. Laboratory fee, $18.

*Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.

165–66 **Multivariate Techniques** (3–3) Staff
Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical, and physical sciences. Prerequisite: Stat 117, 157–58, and Math 124. Laboratory fee, $18. (Academic year)

181 **Applied Time Series Analysis** (3) Staff
Auto- and cross-correlation, spectral analysis, coherence, transfer relations, linear filters, seasonal adjustment, mean square regression, autoregressive moving average models, forecasting, Box-Jenkins methods, spectral analysis of variance, and signal detection and discrimination methods. Prerequisites: a first course in statistics, calculus. Laboratory fee, $30. (Spring)

183 **Intermediate Statistical Laboratory** (3) Staff
Applications to advanced experimental design and other topics. Admission by permission of instructor. Laboratory fee, $25. (Fall or spring)

187 **Theory of Sampling** (3) Staff
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 **Nonparametric Statistical Inference** (3) Lilliefors
Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)

189–90 **Mathematical Probability and Applications** (3–3) Staff
Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year)

193 **Survey Design** (3) Staff
Applications of survey methodology, including questionnaire design and wording, field methods, interviewer and nonresponse biases, and quality-control procedures. Problems in sample frame development. Prerequisite: Stat 187 or equivalent, and permission of instructor. (Spring)

195 **Reading and Research in Statistics** (arr.) Staff
May be repeated once for credit. (Fall and spring)

*197 **Digital Computer Programming with Applications** (3) Thomas
Lecture (2 hours), laboratory (2 hours). Use of digital computer in statistical and other computational work. Writing, debugging, and running programs on the digital computer in the University Computer Center. Prerequisite: Stat 118; or Math 32; or permission of instructor. Laboratory fee, $25. (Fall and spring)

198 **Current Topics in Computer Programming** (3) Rutiser
Concepts of programming, programming languages, operating systems, nonnumeric programming compiler techniques. Prerequisite: Stat 114 or permission of instructor. Laboratory fee, $25. May be repeated for credit. (Spring)

* Credit will not be given for both Stat 97 and Stat 197.

Third Group

201–2 **Mathematical Statistics** (3–3) Staff
Distribution theory, sampling theory, estimation, sufficient statistics, hypothesis testing, analysis of variance, multivariate normal distribution. Prerequisite: advanced calculus or permission of instructor. (Academic year)

205 **Data Analysis for Policy Decisions** (3) Kirsch
The framing of questions of importance in policy and the use of existing data bases to answer these questions. Laboratory fee, $20. Prerequisite: Stat 105 or equivalent. May be repeated once for credit.

206 **Multivariate Methods in the Behavioral Sciences** (3) Kirsch
(Formerly Factor Analysis)
Application of multivariate analysis to data of the social sciences. Techniques covered will include factor analysis, cluster analysis, discriminant analysis, and other topics. Prerequisite: Stat 105 or 118, and prior permission of the instructor. Not open to graduate students in statistics. Laboratory fee, $20. (Summer)

217–18 **Advanced ANOVA and Experimental Design** (3–3) Staff
Advanced theory and application of general linear hypothesis to experimental designs. Prerequisite: Stat 157–58 or 201–2; Math 124. (Academic year)

221 **Design of Experiments for Behavioral Sciences** (3) Kirsch
Applications of advanced experimental design to research problems in behavioral sciences and education. Prerequisite: Stat 105 or 118 or equivalent and permission of instructor. Not open to graduate students in statistics. (Spring)

223–24 **Bayesian Inference** (3–3) Staff
Systematic development of Bayesian viewpoint, with applications to the classical problems of statistics. Prerequisite: Stat 201–2.

225–26 **Introduction to Biostatistics** (3–3) Staff
Probability models, inference, and study design as applied to biomedical investigations. Prerequisite: Stat 201–2. (Alternate academic years)

231 **Contingency Table Analysis** (3) Staff
A study of the theoretical bases underlying the analysis of categorial data. Prerequisite: Stat 201–2 or 257–58.

242 **Advanced Statistical Problems in Economic Analysis** (3) Gastwirth
Applications of advanced theory to economic data.

257–58 **Distribution Theory** (3–3) Staff
Properties of distribution and characteristic functions, probability bounds, large- and small-sample theory, order statistics. Prerequisite: Stat 157–58 or 201–2. (Alternate academic years)

259–60 **Advanced Mathematical Probability** (3–3) Staff
Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: Math 224 or equivalent. (Alternate academic years)

261 **Sequential Design and Analysis** (3) Staff
Wald's theory of sequential designs, optional stopping, choice of sequential experiments. Prerequisite: Stat 201–2. (Spring, odd years)

262 **Nonparametric Inference** (3) Staff
Inference when the form of the underlying distribution is unspecified.

263–64 **Topics in Statistical Inference** (3–3) Lilliefors
Estimation, testing of statistical hypotheses, tests of significance, likelihood ratio, Bayesian inference and the use of prior knowledge, decision theory. Prerequisite: Stat 201–2 or 257–58. (Alternate academic years)

265–66 **Multivariate Analysis** (3–3) Greenhouse
Tests of significance, homogeneity, independence, canonical and vector correlations, multivariate normal distribution, generalized Student's ratio, multivariate linear hypothesis, and analysis of variance. Prerequisite: Stat 201–2 or 257–58; Math 124. (Alternate academic years)

269 **Statistical Decision Theory** (3) Staff
Wald's theory of decision functions. Sequential analysis. Multi-decision problems. Existence theorems, complete class theorems, and other general decision theoretic results. Prerequisite: Stat 189–90; and 201–2 or 257–58.

273–74 **Stochastic Processes** (3–3) Staff
Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Prerequisite: Stat 189–90; and 201–2 or 257–58. (Alternate academic years)

275 **Econometrics I: Introduction** (3) Staff
Joint offering of the Departments of Statistics and Economics. Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equations problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Recommended: a course in matrix theory. (Fall)

276 **Econometrics II: Simultaneous Equations Models** (3) Staff
Joint offering of the Departments of Statistics and Economics. Economic models and simultaneous equations systems. Prerequisite: Stat 275. (Spring)

279 **Methods in Economic Statistics** (3) Gastwirth
Joint offering of the Departments of Statistics and Economics. Statistical methods, such as regression, curve fitting, and index numbers used to summarize and analyze economic data. Prerequisite: Stat 111 or equivalent. (Fall and spring)

281 **Time Series Analysis I: Foundations** (3) Staff
Basic structure of stationary time series. Differentiation, integration, spectral representations, linear filtering, mean square estimation, the Finite Fourier Transform, laws of large numbers, autoregressive moving average processes. Prerequisite: Stat 201–2 and 259–60 or 273–74. (Fall, even years)

282 **Time Series Analysis II: Statistical Inference** (3) Staff
Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance. Prerequisite: Stat 281. (Spring, odd years)

283 **Advanced Statistical Laboratory** (3) Staff
Application of the University computer to complex statistical problems on an individual study basis. Admission by permission of instructor. Laboratory fee, $25. May be repeated for credit only with permission of the Department. (Fall and spring)

285–86 **Seminar: Special Topics in Sample Survey** (3–3) Wolter
Admission by permission of instructor.

287–88 **Modern Theory of Sample Surveys** (3–3) Wolter
Application of statistical theory to the sampling of finite populations. Simple, stratified, cluster, double and subsampling. Special topics, including super-populations and randomized response. Prerequisites: Stat 91 and Math 32 or equivalent. (Academic year)

289 **Seminar** (3) Staff
Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) Staff
Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) Staff
Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Reading and Research** (3) Staff
May be repeated once for credit. (Fall or spring)

297 **Problems in Mathematical Statistics** (3) Staff

298 **Seminar: Special Topics** (3) Staff

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

378 **Seminar: Topics in Econometrics** (3) Staff
Joint offering of the Departments of Statistics and Economics. Limited to graduate students, primarily for doctoral students; offered as demand requires. A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

UNIVERSITY COURSES

University Professors M. Cunliffe, A. Etzioni

University courses are offered by distinguished scholars and scientists who hold appointments as University Professors independent of any school or division. With the approval of the department or program, appropriate University courses may be taken to satisfy degree program requirements. Permission of the University Professor is required.

Second Group

101 **The Contemporary American Society** (3) Etzioni
A social science perspective on the American society, its main institutions and dynamics. An analysis of the concepts which allow continued insight into America's condition, and its future. Permission of instructor is not required for enrollment. (Spring)

103–4 **American Intellectual History** (3–3) Cunliffe
Same as AmCv/Hist 103–4. Ideas, their exponents and their influence, relating to government and politics, religion, culture, personal and group behavior, and other topics. Univ 103: from Jamestown to the Civil War. Univ 104: since the Civil War. (Academic year)

Third Group

201–2 **Private Property in America: The History of an Idea** (3–3) Cunliffe
Ideas about private property touch every aspect of American life. An analysis of key areas and issues. Univ 201: 17th to the late 19th century. Univ 202: up to the present day. (Academic year)

204 **Public Policy Research** (3) Etzioni
Basic concepts of policy research in comparison to basic and applied research. Policy research methods. The social structure of policy research: producers and consumers of knowledge and issues arising among them. (Fall)

URBAN AND REGIONAL PLANNING—GRADUATE PROGRAM

Professors D.C. McGrath, Jr. *(Chairman)*, S.S. Fuller
Associate Professors S. Greene, J.N. Pearce
Associate Professorial Lecturers D. Myhra, A. Kreimer
Assistant Professor D. Gale
Visiting Lecturer O.T. Carr, Jr.

A program leading to the degree of Master of Urban and Regional Planning, which provides preparation for professional practice in the planning field, and areas of specialization in planning as components of programs leading to the degrees of Master of Public Administration, Doctor of Business Administration, and Doctor of Public Administration, are offered by the School of Government and Business Administration (see pages 135–64).

Second Group

153 **Principles of Urban Planning and Design** (3) Greene
Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Fall)

Third Group

201 **Introduction to Urban and Regional Planning** (3) McGrath and Staff
Introduction to history, concepts, and activities of urban and regional planning. Discussion of trends in urbanism and the influences of technology and social change. (Fall and spring)

202 **Urban Planning Theory** (3) Gale
Development of the fundamental theories and concepts of urban growth and change, theories of the planning process, the role of politics in the planning process, and roles of the planner. Prerequisite: U&RP 201 or permission of instructor. (Fall and spring)

203 **Fundamentals of Urban Design** (4) Greene
Planning and design studio to develop and apply planning methods and graphic techniques, principles of land use and urban design; analysis of factors affecting community development and change. Open only to candidates for the degree of Master of Urban and Regional Planning. Laboratory fee, $20. Prerequisite: U&RP 201 and 212 or permission of instructor. (Spring)

207 **Land Development Planning** (3) McGrath
Selected problems in urban and regional planning: applications of zoning, urban renewal and special programs available for the implementation of development plans. Prerequisite: U&RP 201 or permission of instructor. (Fall)

208 **Urban Transportation Planning** (3) McGrath
Relationships between land use and the movement of goods and people in urban areas. Transportation planning principles, policy problems, methods for analyzing demand and systems for urban travel; roles of public agencies and private interests in the planning and development of various modes. Prerequisite: U&RP 201. (Spring)

210 **Urban Development Economics** (3) Fuller
Economic forces affecting urban growth and change; relationships among cities, metropolitan areas, and regions in the context of the national economy; socioeconomic implications of urban land development policies; basic studies and methods of economic analysis. Prerequisite: Econ 217–18 or equivalent; U&RP 201. (Spring)

212 **Methods of Urban and Regional Analysis** (3) Fuller
Introduction to methods used to analyze, estimate, and forecast population, employment, income and economic growth and development. Includes time series, index numbers, sampling, regression, shift-share, and input-output. Prerequisite: Stat 51 or equivalent. (Fall)

215 **Advanced Planning Problems** (4) McGrath and Staff
Investigation of complex problems of the metropolitan region, analy-

sis of findings, formulation of proposals, and presentation of material to faculty and cooperating groups. Multidisciplinary team and individual planning projects. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203. (Fall)

Fuller

218 **Metropolitan and Regional Planning** (3)

Multidisciplinary study of the methods of regional analysis and process of regional planning; development of projects of regional scale requiring problem analysis, synthesis, and plan formulation. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203 and 212 or permission of instructor. (Spring)

Fuller

232 **Urban Environment and the Planner** (3)

Exploration of the relationship between people and their urban environment; emphasis on the role of the urban planner. Theory, research, planning methods, current issues, and laws examined. Prerequisite: U&RP 201 or permission of instructor. (Spring)

Gale

240 **Federal and State Urban Policy Development** (3)

Investigation of contemporary trends in the evolution of federal and state governmental functions and programs affecting urban growth and development policy. Planning functions in the evolving relationships among units of federal, state, and metropolitan agencies. Prerequisite: U&RP 201 or permission of instructor. (Spring)

Fuller

251 **Housing and Community Development: Concepts and Methods** (3)

An examination of the basic theories, concepts, principles, and analytical methods for managing the planning process by which cities approach the resolution of their development and housing needs. Housing supply and demand conditions, market analysis, physical inventory methods, community facility planning and impact analysis, commercial revitalization, and neighborhood theory and dynamics. Prerequisite: U&RP 201 or permission of instructor. (Fall)

Gale

252 **Housing and Community Development: Case Studies and Applications** (3)

The application of theory and methodology to contemporary housing and community development issues. Examination of federal policies and programs, community facilities, redevelopment and adaptive reuse projects, and the role of the private sector. Case studies and field trips. Prerequisite: U&RP 251 or permission of instructor. (Spring)

Fuller

255 **Urban Housing** (3)

(Formerly U&RP 205)

Examination of the building industry, housing market characteristics, analytical techniques, national needs, costs, financing, federal programs, technology, rehabilitation, and policy formulation. Prerequisite: U&RP 201. (Spring)

Gale

256 **Neighborhood Dynamics** (3)

(Formerly U&RP 213, Social Factors in Urban Planning)

Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns. Effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer)

257 **Fiscal Policy and Urban Planning** (3) Gale
(Formerly U&RP 242)
Consideration of municipal fiscal conditions and their implications for urban planning. Examination of capital projects financing, tax policy and land use, and fiscal impact analysis of urban development. Prerequisite: U&RP 201 or permission of instructor. (Fall)

261 **Community Planning and Design: Concepts and Methods** (3) Greene
Investigation of perceptual, social, physical, and aesthetic factors in planning and design. Emphasis on interaction of users and the environment, principles and process of community design, visual analysis, evaluation and implementation techniques. Prerequisite: U&RP 203 or permission of instructor. (Fall)

262 **Community Planning and Design: Case Studies and Applications** (3) Greene
(Formerly U&RP 204, Urban Planning Development)
Planning and design studio; application of community design principles and process to typical problems of community change and development. Laboratory fee, $20. Prerequisite: U&RP 261 or permission of instructor. (Spring)

263 **Community Preservation and Design Studio** (3) Greene
Interdisciplinary studio class: application of the techniques and methods of historic preservation, urban planning, housing and community development, community design, and other disciplines to problems of revitalizing urban areas. Surveys, inventories, analyses, formulation of proposals, and presentation to faculty and cooperating groups. Laboratory fee, $20. Prerequisite: U&RP 201 or permission of instructor. (Summer)

276 **U. S. Architectural History** (3) Pearce
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Basic stylistic developments in American architecture from the 17th through the 20th centuries, with special emphasis on the applicability of style recognition to buildings and neighborhoods in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

277–78 **Historic Preservation** (3–3) Pearce
Joint offering of the History and Urban and Regional Planning Departments and the American Studies Program. The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural and humanistic values affecting preservation activities. (Academic year)

290 **Special Topics in Urban and Regional Planning** (3) Staff
Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3) Staff
Directed research and investigation of special problems in community development. May be repeated once for credit. (Fall and spring)

298 **Directed Readings and Research in Urban and Regional Planning** (3) Staff

299 **Thesis Seminar** (3)
Examination of thesis standards, research philosophy and methodology. (Fall and spring)
Fuller, Staff

300 **Thesis Research** (3)
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3)
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.
Chitwood, Staff

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)
Staff

399 **Dissertation Research** (arr.)
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)
Staff

WOMEN'S STUDIES—GRADUATE PROGRAM

Assistant Professor P.M. Palmer *(Coordinator for Academic Affairs)*
Adjunct Assistant Professors E. Bloomfield, S. Leader

Committee on Women's Studies

V.R. Allan, E. Bloomfield, M.M. Cassidy, C.W. Conable, S.E. Haber, S. Leader, P.M. Palmer, S.J. Tolchin, R. Wallace

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in Special Studies with a concentration in Women's Studies, directed by the Committee on Women's Studies and drawing upon faculty from various departments within the university and resource persons in the community.

Women's studies seeks to examine and integrate the contributions of established academic disciplines to an understanding of the historical and contemporary role and status of women, and to provide training necessary to evaluate and formulate equitable public policy for women. Each student will work closely with an advisor in designing a program to meet individual research interests and professional goals. Prospective candidates should consult with the director of the Women's Studies Program.

Master of Arts in Special Studies with a concentration in Women's Studies. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements, pages 91–99, and 36 semester hours of course work, with or without a thesis. At least 21 hours must be taken in arts and sciences departments. WStu 220, 225, 240, and 241 are required for all students; WStu 283 and 295 are required for students who do not elect a thesis; WStu 299–300 is required for those who elect a thesis. Of the remaining six courses, it is required that four be concentrated in one other department such as Economics, Sociology, or Public Administration, and that one be a graduate-level methodology course. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

220 **Perspectives on Women** (3) Palmer

Research and theory from the social sciences and humanities as they influence the concept of public policies on women at work, in families, and in education. (Fall)

221 **Research Issues in Women's Studies** (3) Staff

Socialization and the educational system, work and the economy, sexuality and the family, health and life cycle issues. Problem identification in these and other areas; introduction to current research. Prerequisite: WStu 220. (Fall)

225 **Feminist Theory** (3) Palmer

Theoretical foundations of feminism in the U.S. Theories and proposals for change currently espoused. Although focus is primarily on feminism of contemporary white America, some third world and European thought will be considered. (Fall)

240 **Women and Public Policy** (3) Leader

Systematic analysis of public policy formation at the federal, state, and local levels as it relates to the status of women. Strategies for change and impact of the women's movement. Team and individual research projects on executive decision-making, legislation and its implementation, and political party structures. (Spring)

241 **Women and the Law** (3) Bloomfield

Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Fall and spring)

251 **Women, Literature, and the Arts** (3) Staff

Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Spring)

260 **Women in the American Work Force** (3) Palmer

Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary analysis of women's role in the labor force and historical changes in that role. Societal view of women's work in the home and outside it; interrelationships of women in and out of the work force; women's contributions, traditionally and during national crises; class, race, and ethnic differences. (Spring)

270 **Seminar: Selected Topics** (3) Staff

Investigation of a current policy issue of particular concern to women, or consideration of women's status in a particular social system. (Fall and spring)

280 **Independent Study** (3) Staff
May be repeated for credit. Arrangements must be made with spon-
soring faculty member prior to registration.

283 **Practicum in Women's Studies** (3) Palmer
Study of the changing status of women through supervised assign-
ment to public and private agencies engaged in education, counseling
political action, and research. Placement arrangements should begin
the semester prior to registration for this course.

284 **Practicum** (arr.) Palmer

295 **Independent Research in Women's Studies** (arr.) Staff
Individual library or field research. Program advisor's approval of a
written proposal required.

299–300 **Thesis Research** (3–3) Staff

YIDDISH

See **Classics.**

ZOOLOGY

See **Biological Sciences.**

FACULTY AND STAFF OF INSTRUCTION

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

School of Public and International Affairs

EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*
B.A. 1925, Illinois College; M.S. 1928, University of Chicago; Ph.D. 1932, University of Wisconsin

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Grover LaMarr Angel, *Professor Emeritus of Education*
B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Ruth Harriet Atwell, *Professor Emeritus of Physical Education for Women*
Ph.B. 1918, Denison University; M.A. in Ed. 1933, George Washington University

Richard Adrian Barrett, *Professor Emeritus of Business Administration*
B.A. 1930, Amherst College; M.B.A. 1932, Harvard University; D.B.A. 1972, George Washington University

Gretchen Rogers Bolwell, *Professor Emeritus of German*
B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1938, Johns Hopkins University

Perry Botwin, *Professor Emeritus of Special Education*
B.S. 1942, Rutgers—The State University; M.A. 1947, New York University; Ed.D. 1957, Columbia University

John Withrow Brewer, *Professor Emeritus of Political Science and International Law*
B.A. 1926, M.A. 1930, Ph.D. 1932, Princeton University

Arthur Edward Burns, *Professor Emeritus of Economics*
B.A. 1931, M.A. 1934, University of California, Berkeley; Ph.D. 1935, George Washington University

Elizabeth Burtner, *Professor Emeritus of Physical Education*
B.A. 1927, Hood College; M.A. 1935, Columbia University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University, England

Wesley Thomas Carroll, *Professor Emeritus of Education*
B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

James Harold Coberly, *Professor Emeritus of English*
B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Elbridge Colby, *Professor Emeritus of Journalism*
B.A. 1912, M.A. 1913, Ph.D. 1922, Columbia University

Oswald Symister Colclough, *Professor Emeritus of Law; Dean of Faculties Emeritus; Emeritus Director of the Patent, Trademark, and Copyright Research Institute*
B.S. 1920, U.S. Naval Academy; LL.B. 1935, Sc.D. 1961, George Washington University; LL.D. 1948, Muhlenberg College

Charles William Cole, *Professor Emeritus of English*
B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University

Mary Ellen Coleman, *Professor Emeritus of Education*
B.S. 1937, Madison College; M.A. in Ed. 1950, George Washington University

George Frederick Conner, *Associate Professor Emeritus of Business Administration*
B.S. 1929, U.S. Military Academy; M.B.A. 1938, Harvard University

Milton Crane, *Professor Emeritus of English*
B.A. 1937, M.A. 1938, Columbia University; M.A. 1941, Ph.D. 1942, Harvard University

James Carlton Dockeray, *Professor Emeritus of Finance*
B.A. 1929, Ohio Wesleyan University; M.A. 1931, Ph.D. 1936, Ohio State University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

Frederick Harrell Gibbs, *Professor Emeritus of Health Care Administration*
B.S. 1956, University of Maryland; M.H.A. 1959, University of Minnesota

Ira Bowers Hansen, *Professor Emeritus of Zoology*
B.S. 1928, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Research Professor Emeritus of Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Henry William Herzog, *Vice President and Treasurer Emeritus*
B.S. in C.E. 1930, LL.D. 1978, George Washington University

Thomas Willard Holland, *Professor Emeritus of Labor Economics*
B.A. 1923, University of Michigan; LL.B. 1934, Columbia University; Ph.D. 1939, University of Wisconsin

Thelma Hunt, *Professor Emeritus of Psychology*
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

Herbert Jehle, *Professor Emeritus of Physics*
Dr.Ing. 1933, Institute of Technology, Berlin

Joe Lee Jessup, *Professor Emeritus of Business Administration*
B.S. in B.A. 1936, University of Alabama; M.B.A. 1941, Harvard University; LL.D. 1964, University of Chungang, Korea

Eva Mayne Johnson, *Professor Emeritus of Psychology*
B.A. 1949, M.A. 1951, Ph.D. 1957, George Washington University

Everett Herschel Johnson, *Professor Emeritus of Statistics*
B.A. 1926, DePauw University; M.A. 1929, Lehigh University; Ph.D. 1942, University of Michigan

Elmer Louis Kayser, *Professor Emeritus of European History; Dean Emeritus of the Division of University Students; University Historian*
B.A. 1917, M.A. 1918, LL.D. 1948, George Washington University; Ph.D. 1932, Columbia University; L.H.D. 1975, Mount Vernon College

Virginia Randolph Kirkbride, *Professor Emeritus of Educational Psychology*
B.A. 1941, M.A. 1942, University of Nebraska; Ed.D. 1959, George Washington University

Frances Kirkpatrick, *Professor Emeritus of Home Economics*
B.S. 1919, University of Missouri; M.A. 1929, Columbia University

George Martin Koehl, *Professor Emeritus of Physics*
B.A. 1931, University of North Carolina; M.A. 1933, George Washington University

Solomon Kullback, *Professor Emeritus of Statistics*
B.S. 1927, City University of New York, City College; M.A. 1929, Columbia University; Ph.D. 1934, George Washington University

John Francis Latimer, *Professor Emeritus of Classics*
B.A. 1922, Litt. D. 1964, Mississippi College; M.A. 1926, University of Chicago; Ph.D. 1929, Yale University

Helen Bennett Lawrence, *Professor Emeritus of Physical Education for Women*
B.S. in P.E. 1934, M.A. 1938, George Washington University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Wolfram Karl Legner, *Professor Emeritus of German*
B.A. 1923, Harvard University; M.A. 1932, Ph.D. 1936, University of Pennsylvania

Laurence Pereira Leite, *Professor Emeritus of Art*
M.A. 1956, Ph.D. 1966, Johns Hopkins University

Kurt London, *Professor Emeritus of International Affairs*
Ph.D. 1923, University of Würzburg

William Allan MacDonald, *Professor Emeritus of Art and of Archeology*
B.A. 1940, Oberlin College; M.A. 1942, Ph.D. 1943, Johns Hopkins University

Eugene Ross Magruder, *Associate Professor Emeritus of Business Administration*
B.B.A. 1950, M.B.A. 1951, University of Texas; Ph.D. 1959, Ohio State University

John Russell Mason, *Librarian Emeritus; Curator of Art Emeritus*
B.A. 1923, M.A. 1925, George Washington University; M.S. in L.S. 1933, Columbia University

Muriel Hope McClanahan, *Associate Professor Emeritus of English*
B.A. 1935, Colorado College; M.A. 1937, Ph.D. 1940, University of Pittsburgh

Florence Marie Mears, *Professor Emeritus of Mathematics*
B.A. 1917, Goucher College; M.A. 1924, Ph.D. 1927, Cornell University

Howard Maxwell Merriman, *Professor Emeritus of American Diplomatic History*
B.A. 1930, M.A. 1931, University of Cincinnati; M.A. 1932, Ph.D. 1937, Harvard University

Franz Henry Michael, *Professor Emeritus of International Affairs and Far Eastern History*
Sinological Diploma 1930, University of Berlin; Referendar 1931, Dr.Jur. 1933, University of Freiburg

Robert Hamilton Moore, *Professor Emeritus of English*
B.A. 1934, M.A. 1938, Indiana University; Ph.D. 1948, University of Illinois

Edith Elizabeth Mortensen, *Professor Emeritus of Zoology*
B.A. 1925, Carleton College; M.A. 1927, University of Minnesota; Ph.D. 1945, George Washington University

Charles Rudolph Naeser, *Professor Emeritus of Chemistry*
B.S. 1931, University of Wisconsin; M.S. 1933, Ph.D. 1935, University of Illinois

Kittie Fenley Parker, *Professor Emeritus of Botany*
B.A. 1930, M.A. 1932, University of California, Berkeley; Ph.D. 1946, University of Arizona

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Carl Herman Pfuntner, *Associate Professor Emeritus of Philosophy*
B.A. 1949, M.A. 1953, George Washington University; Ph.D. 1967, Georgetown University

Mary Louise Robbins, *Professor Emeritus of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Blake Smith Root, *Professor Emeritus of Education*
B.S. 1927, Monmouth College, Illinois; M.A. 1931, University of Illinois; Ed.D. 1948, George Washington University

Edward Henry Sehrt, *Professor Emeritus of German*
B.A. 1911, Ph.D. 1915, Johns Hopkins University

Daniel Sinick, *Professor Emeritus of Education*
B.A. 1936, City University of New York, City College; M.A. 1937, State University of New York at Albany; Ph.D. 1955, New York University

William Arthur Smith, *Associate Professor Emeritus of Mathematics*
B.A. 1941, M.A. 1947, Syracuse University

Waldo Sommers, *Professor Emeritus of Public Administration*
B.A. 1927, Heidelberg College; M.A. 1934, Ph.D. 1948, Yale University

Edwin Lockwood Stevens, *Professor Emeritus of Speech*
B.A. 1936, Rutgers—The State University; M.A. 1942, Columbia University

Karl Ernest Stromsem, *Professor Emeritus of Public Administration*
B.A. 1930, Pomona College; Ph.D. 1935, University of California, Berkeley

Harold Griffith Sutton, *Director of Admissions Emeritus*
B.A. 1918, Ohio State University; M.S. 1921, Columbia University

Geza Teleki, *Professor Emeritus of Geology*
Ph.D. 1936, University of Vienna

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Kathryn Mildred Towne, *Professor Emeritus of Home Economics*
B.S. 1923, Montana State University; M.A. 1930, Columbia University

Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

William Lewis Turner, *Associate Professor Emeritus of English*
B.A. 1934, M.A. 1941, Ph.D. 1952, University of Pennsylvania

Robert Corbin Vincent, *Professor Emeritus of Chemistry*
B.A. 1935, M.A. 1937, Ph.D. 1940, Cornell University

Donald Stevenson Watson, *Professor Emeritus of Economics*
B.A. 1930, University of British Columbia; Ph.D. 1935, University of California, Berkeley

Robert Louis Weintraub, *Professor Emeritus of Botany*
B.S. 1931, M.A. 1933, Ph.D. 1938, George Washington University

Edward Ronald Weismiller, *Professor Emeritus of English*
B.A. 1938, Litt.D. 1953, Cornell College; M.A. 1942, Harvard University; D.Phil. 1950, Oxford University

Warren Reed West, *Professor Emeritus of Political Science*
B.A. 1918, George Washington University; Ph.D. 1922, Johns Hopkins University

Ralph Kirby White, *Professor Emeritus of Social Psychology*
B.A. 1929, Wesleyan University; Ph.D. 1937, Stanford University

Marvin Milton Wofsey, *Professor Emeritus of Management*
B.S. 1935, New York University; M.A. 1943, Ph.D. 1967, American University

Donnell Brooks Young, *Professor Emeritus of Zoology*
B.S. 1911, Amherst College; Ph.D. 1923, Columbia University

ACTIVE*

Robert D. Abbott, *Assistant Professorial Lecturer in Statistics*
B.S. 1972, Western Michigan University; M.P.H. 1974, M.A. 1974, Ph.D. 1977, University of Michigan

†Fred Paul Abramson, *Associate Professor of Pharmacology*
B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Eugene Abravanel, *Professor of Psychology*
B.A. 1955, University of Michigan; M.A. 1960, Swarthmore College; Ph.D. 1965, University of California, Berkeley

Jeanne Vermilyea Ackerman, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1948, Russell Sage College; M.A. in Ed. 1972, George Washington University

Arvil Van Adams, *Research Professor of Education Policy and of Economics*
B.A. 1965, M.B.A. 1966, Memphis State University; M.A. 1968, Ph.D. 1970, University of Kentucky

Elizabeth Byrne Adams, *Professor of Management*
B.S. 1955, City University of New York, Queens College; M.A. in Ed. 1957, George Washington University; Ph.D. 1974, American University

William Clayton Adams, *Assistant Professor of Public Administration*
B.A. 1971, M.A. 1972, Baylor University; Ph.D. 1977, George Washington University

Lewis Francis Affronti, *Professor of Microbiology*
B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

Yoshio Akiyama, *Associate Professorial Lecturer in Mathematics*
M.A. 1963, Andrews University; Ph.D. 1967, University of Minnesota

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1945, University of Baghdad; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Frank Duane Allan, *Professor of Anatomy*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

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* The University Faculty is composed of the President of the University, the Vice President for Academic Affairs, the Director of Admissions, the Registrar, the University Librarian, the Treasurer, the Director of the Student Health Service, and the membership of the several college and school faculties.

† On sabbatical leave academic year 1981-82.

John Gage Allee, Jr., *Professor of English*
B.A. 1939, M.A. 1940, George Washington University; Ph.D. 1955, Johns Hopkins University

Catherine Allen, *Assistant Professor of Anthropology*
B.A. 1969, St. John's College (Maryland); M.A. 1972, Ph.D. 1978, University of Illinois

David Aron Altshuler, *Assistant Professor of Religion*
B.A., M.A. 1971, Brown University; Ph.D. 1977, Hebrew Union College

Frederick Amling, *Professor of Business Finance*
B.A. 1948, Baldwin-Wallace College; M.B.A. 1949, Miami University; Ph.D. 1957, University of Pennsylvania

Jeffrey Clifford Anderson, *Assistant Professor of Art*
B.A. 1970, University of Pittsburgh; M.F.A. 1973, Ph.D. 1976, Princeton University

Rebecca Jane Anderson, *Associate Professor of Pharmacology*
B.A. 1971, Coe College; Ph.D. 1975, Georgetown University

W. French Anderson, *Adjunct Professor of Genetics*
B.A. 1958, M.D. 1963, Harvard University; M.A. 1960, Cambridge University

Avery Delano Andrews, *Associate Professor of History; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1950, Harvard University; LL.B. 1953, M.A. 1958, Ph.D. 1962, University of Pennsylvania

Dennis P. Andrulis, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1969, Fordham University; Ph.D. 1973, University of Texas; M.P.H. 1976, University of North Carolina

John Lawrence Angel, *Professorial Lecturer in Anatomy and Anthropology*
B.A. 1936, Ph.D. 1942, Harvard University

Joseph Paul Ansell, *Assistant Professorial Lecturer in Art*
B.A. 1971, Knox College; M.F.A. 1975, George Washington University

Ricardo Anzola-Betancourt, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.Arch. 1969, Cornell Unversity

Daniel Appleman, *Professorial Lecturer in Geology*
B.S. 1953, California Institute of Technology; M.A. 1954, Ph.D. 1956, Johns Hopkins University

Ghassan M. Arnaoot, *Professorial Lecturer in Business Administration*
B.B.A. 1960, University of Cairo; Ph.D. 1970, University of Texas

Nancy D. Arnesen, *Lecturer in English*
B.A. 1948, University of Michigan; M.A. 1968, Kent State University

*Joseph Aschheim, *Professor of Economics*
B.A. 1951, University of California, Berkeley; M.A. 1953, Ph.D. 1954, Harvard University

Muriel Ann Atkin, *Assistant Professor of History*
B.A. 1967, Sarah Lawrence College; M.Phil 1971, Ph.D. 1976, Yale University

David Lynn Atkins, *Professor of Biology*
B.A. 1957, University of Texas; M.A. 1963, East Texas State University; Ph.D. 1970, Texas A&M University

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1933, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1966, University of Chicago

A.M. Attallah, *Adjunct Associate Professor of Genetics*
B.S. 1957, Alexandria University, Egypt; D.E.A. 1971, University of Paris; Ph.D. 1974, George Washington University

Ines Azar, *Associate Professor of Spanish*
M.A. 1969, Ph.D. 1974, Johns Hopkins University

William Back, *Professorial Lecturer in Geology*
B.S. 1948, University of Illinois; M.S. 1955, University of California, Berkeley; M.P.A. 1956, Harvard University; Ph.D. 1969, University of Nevada

John Bailar III, *Professorial Lecturer in Statistics*
B.A. 1953, University of Colorado; M.D. 1955, Yale University; Ph.D. 1973, American University

John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

* On sabbatical leave academic year 1981-82.

Robert Edward Baker, *Professor of Education; Assistant Dean of th School of Education and Human Development*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1954, Catholic University o America; M.A. in Ed. 1956, Ed.D. 1962, George Washington University

Morton S. Baratz, *Visiting Professor of Public Administration*
B.A. 1947, University of Connecticut; M.A. 1949, Ph.D. 1952, Yale University

Michael M. Barch, *Assistant Professorial Lecturer in Health Services Ad ministration*
B.S. 1972, M.A. 1974, University of Southwestern Louisiana

Ruth Lillian Aaronson Bari, *Professor of Mathematics*
B.A. 1939, City University of New York, Brooklyn College; M.A. 1943, Ph.D. 1968, Johns Hopkins University

Shirley Russell Barnett, *Associate Professor of Spanish*
B.A. 1944, Vassar College; M.A. 1946, Vanderbilt University; Ph.D. 1958, University of Minnesota

Albert Barnhart, *Assistant Professorial Lecturer in Art*
B.A. 1970, University of Maryland; M.A. 1974, State University of New York College at Oswego

Theodore M. Barnhill, *Assistant Professor of Business Administration*
B.S. 1968, Tennessee Technological University; M.S. 1969, M.B.A. 1971, Ph.D. 1974, University of Michigan

James Richard Barth, *Professor of Economics*
B.A. 1965, California State University at Sacramento; M.A. 1967, University of New Mexico; Ph.D. 1972, Ohio State University

Elio Lee Battaglia, *Assistant Professorial Lecturer in Photography*
B.J. 1958, M.A. 1968, University of Missouri

Samuel Baum, *Professorial Lecturer in Geography and Regional Science*
B.A. 1950, City University of New York, Brooklyn College

Barbara Louise Bean, *Assistant Professor of Pharmacology*
B.S. 1970, University of Surrey; Ph.D. 1976, University of London

DeLawrence Beard, *Assistant Professorial Lecturer in Forensic Sciences*
J.D. 1970, University of Baltimore; LL.M. 1977, Georgetown University

Lucille Bluso Beck, *Assistant Professorial Lecturer in Speech and Drama*
B.A. 1971, Adelphi University; M.A. 1973, Ph.D. 1978, University of Maryland

William H. Becker, *Visiting Associate Professor of History; Faculty Associate for Business Studies, Division of Experimental Programs*
B.A. 1964, Muhlenberg College; Ph.D. 1969, Johns Hopkins University

Norman Beckman, *Professorial Lecturer in Public Administration*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1952, Syracuse University; Ph.D. 1957, Columbia University

Nariman Behravesh, *Assistant Professorial Lecturer in Economics*
B.S. 1970, Massachusetts Institute of Technology; M.A. 1972, Ph.D. 1978, University of Pennsylvania

Andrea Jean Beley, *Adjunct Instructor in English*
B.A. 1974, University of Pittsburgh; M.Ed 1978, Temple University

Peter Ben Ezra, *Assistant Professorial Lecturer in Accounting*
B.S. 1972, University of Maryland; M.S. in Adm. 1975, George Washington University

Robert Stephen Bennett, *Associate Professorial Lecturer in Forensic Sciences*
LL.B 1964, Georgetown University; LL.M. 1965, Harvard University

*Otto Bergmann, *Professor of Physics*
Ph.D. 1949, University of Vienna

†David Francis Bergwall, *Assistant Professor of Health Services Administration*
B.S. 1969, M.B.A. 1970, Ball State University; D.B.A. 1978, George Washington University

Richard Lewis Bernknopf, *Assistant Professorial Lecturer in Economics*
B.A. 1970, Ph.D. 1980, George Washington University

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* On sabbatical leave academic year 1981-82.
† On leave of absence academic year 1981-82.

Lee Sheward Bielski, *Professor of Speech*
B.S. 1940, Ohio University; M.A. 1944, University of Michigan

Paul Philip Biemer, *Associate Professorial Lecturer in Statistics*
B.S. 1972, M.S. 1975, Ph.D. 1978, Texas A&M University

Philip Stanley Birnbaum, *Professor of Health Services Administration and of Health Care Sciences; Dean of the Medical Center, for Administrative Affairs*
B.S. in M.E. 1948, M.S. in M.E. 1949, Carnegie-Mellon University; B.C.E. 1954, Rensselaer Polytechnic Institute

*Guy Black, *Professor of Business Economics*
B.S. 1941, Harvard University; M.A. 1948, Ph.D. 1951, University of Chicago

Anne Heiberg Blackwill, *Assistant Professorial Lecturer in English*
B.A. 1962, Wheaton College; M.A. 1964, Ph.D. 1971, Stanford University

Robert James Blatt, *Studio Lecturer in Applied Music (Cello)*
B.Mus. 1967, Johns Hopkins University

Sherman Bloom, *Professor of Pathology*
B.A. 1955, M.D. 1960, New York University

Elaine Bloomfield, *Adjunct Assistant Professor of Women's Studies*
B.A. 1967, Case Western Reserve University; J.D. 1971, George Washington University

Charlotte Renee Blount, *Associate Professorial Lecturer in Journalism*
B.A. 1974, American University

Elliot Blum, *Associate Clinical Professor of Psychology*
B.B.A. 1958, City University of New York, City College; M.S. 1960, Long Island University; Ph.D. 1965, Florida State University

Jeffrey Blumenfeld, *Assistant Professorial Lecturer in Forensic Sciences*
J.D. 1973, University of Pennsylvania

Clarence E. Bohn, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1938, Michigan State University; J.D. 1950, Georgetown University

Jody Bolz, *Lecturer in English*
B.A. 1971, M.F.A. 1973, Cornell University

John Borriello, *Clinical Professor of Psychology*
B.A. 1952, M.Ed. 1953, Boston University; Ph.D. 1957, University of Minnesota

John Gordon Boswell, *Professor of Education*
B.A. in Ed. 1953, M.A. in Ed. 1956, Ed.D. 1963, George Washington University

Mollie H. Bowers, *Assistant Professor of Business Administration*
B.A. 1967, University of Rochester; M.A. 1969, University of Wisconsin; Ph.D. 1974, Cornell University

Lloyd Spencer Bowling, *Professor of Speech and Hearing*
B.A. 1954, M.A. 1957, Ed.D. 1964, University of Maryland

Thomas Elliot Bowman, *Adjunct Professor of Biological Sciences*
B.S. 1941, Harvard University; M.A. 1948, University of California, Berkeley; Ph.D. 1954, University of California, Los Angeles

George Robert Bozzini, *Associate Professor of English*
B.S. 1961, Ph.D. 1971, Georgetown University

Linda Brandt *Associate Professor of Psychology*
B.A. 1963, Elmhurst College; M.A. 1965, Clark University; Ph.D. 1973, University of London

James Lowell Breen, *Professor of Human Kinetics and Leisure Studies*
B.S. 1948, Eastern Illinois University; M.S. 1949, Ph.D. 1959, University of Illinois

William Dudley Breneman, *Assistant Professor of Business Administration*
B.A. 1967, Texas A&M University; J.D. 1970, John Marshall Law School

Marcella Brenner, *Professor of Education*
B.S. in Ed. 1934, Johns Hopkins University; M.A. 1949, American University; Ed.D. 1962, George Washington University

Mary Diane Majerus Brewer, *Associate Professor of Speech*
B.A. 1963, M.A. 1965, University of Iowa

Harold Frederick Bright, *Professor of Statistics; Provost and Vice President for Academic Affairs*
B.A. 1937, Lake Forest College; M.S. 1944, University of Rochester; Ph.D. 1952, University of Texas

* On sabbatical leave fall semester 1981.

A. D. Britt, *Professor of Chemistry*
B.S. 1957, West Texas State University; M.A. 1961, Ph.D. 1963, Washington University

J. Thomas Broach, *Lecturer in Physics*
B.S. 1969, Louisiana State University; M.S. 1975, American University

John Caruthers Broderick, *Adjunct Professor of English*
B.A. 1948, Southwestern at Memphis; M.A. 1949, Ph.D. 1953, University of North Carolina

Stuart Lee Brodsky, *Associate Professorial Lecturer in Mathematics*
B.S. 1964, Illinois Institute of Technology; M.S. 1965, Ph.D. 1969, Stanford University

David Michael Brody, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1956, Harvard University; M.D. 1961, University of Virginia

Michael George Bromley, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1968, Medical College of South Carolina

Alison Spence Brooks, *Associate Professor of Anthropology*
B.A. 1965, Radcliffe College; M.A. 1967, Ph.D. 1979, Harvard University

David Alan Brown, *Professorial Lecturer in Art*
B.A. 1964, Harvard University; M.A. 1967, Ph.D. 1973, Yale University

David Springer Brown, *Professor of Management*
B.A. 1936, University of Maine at Orono; Ph.D. 1955, Syracuse University

Frederick James Brown, Jr., *Professor of Education*
B.A. 1947, M.Ed. 1951, Western Maryland College; Ed.D. 1962, Columbia University

Nigel Andrew Brown, *Assistant Professor of Pharmacology*
B.S. 1973, University of Leeds; Ph.D. 1977, University of Surrey

*Robert Guy Brown, *Professor of Sociology*
B.A. 1949, University of Rhode Island; M.A. 1951, Ph.D. 1960, University of North Carolina

Arnold Rahn Bruhn, *Assistant Professor of Psychology*
B.A. 1963, M.A. 1966, University of Portland; Ph.D. 1976, Duke University

David Brusick, *Adjunct Assistant Professor of Genetics*
B.S. 1963, University of Illinois; M.S. 1965, Ph.D. 1970, Illinois State University

Ben Burdetsky, *Professor of Personnel and Labor Relations*
B.S. 1950, M.S. 1958, Temple University; Ph.D. 1968, American University

Elisabeth Ann Burkhardt, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1966, University of Maryland

James Franklin Burks, *Professor of French*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Indiana University

John Robert Burns, *Assistant Professor of Zoology*
B.S. 1968, City University of New York, Brooklyn College; M.S. 1972, Ph.D. 1974, University of Massachusetts

Martha Burns, *Associate Professor of Education*
B.S. 1964, University of Bridgeport; M.Ed. 1967, Ed.D. 1971, Pennsylvania State University

Martin Alexander Buzas, *Adjunct Professor of Geology*
B.A. 1958, University of Connecticut; M.S. 1960, Brown University; Ph.D. 1963, Yale University

Kay Mitchell Calavan, *Assistant Professorial Lecturer in Anthropology*
B.A. 1963, Ph.D. 1974, University of Illinois

*Willard Edmund Caldwell, *Professor of Psychology*
B.A. 1940, M.A. 1941, University of Florida; Ph.D. 1946, Cornell University

Peter George Callas, *Assistant Professorial Lecturer in Education*
B.A. 1949, M.A. 1955, Western Maryland College; Ed.D. 1972, George Washington University

Gerard Caprio, Jr., *Assistant Professorial Lecturer in Economics*
B.A. 1972, Williams College; M.A. 1974, Ph.D. 1976, University of Michigan

Edward Alan Caress, *Professor of Chemistry; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1958, Dartmouth College; Ph.D. 1963, University of Rochester

J. Ronald Carey, *Assistant Professor of Business Administration*
B.S. 1961, Bucknell University; Ph.D. 1974, University of Texas

Albert Jason Caron, *Research Professor of Psychology*
M.A. 1949, Ph.D. 1954, University of Chicago

* On sabbatical leave academic year 1981-82.

Rose Friedman Caron, *Adjunct Professor of Psychology*
B.A. 1948, Vassar College; M.A. 1950, Ph.D. 1955, University of Chicago

Oliver T. Carr, Jr., *Visiting Lecturer in Urban Development Planning*

Gerald Vincent Carroll, *Professor of Geology*
B.A. 1943, Lehigh University; Ph.D. 1952, Yale University

Janet Schall Carroll, *Lecturer in English*
B.A. 1968, George Washington University

Susan Jane Carroll, *Assistant Professor of Political Science*
B.A. 1972, Miami University; M.A. 1975, Ph.D. 1980, Indiana University

Thomas Frank Carroll, *Adjunct Professor of Economics*
B.A. 1942, Case Western Reserve University; M.S. 1947, Ph.D. 1950, Cornell University

Barbara Gilbert Carson, *Assistant Professorial Lecturer in American Civilization and in Art History*
B.A. 1963, Brown University; M.A. 1965, University of Delaware

John H. Carson, *Associate Professor of Management Science*
B.S. in E.E. 1969, M.S. 1970, Ph.D. 1976, Lehigh University

Geoffrey Carter, *Assistant Professor of English*
B.A. 1963, Cambridge University; Ph.D. 1969, University of Pennsylvania

Patricia Murphy Carter, *Lecturer in English*
B.A. 1951, M.A. 1970, M.A. in Ed. 1977, George Washington University

Marie Mullaney Cassidy, *Professor of Physiology*
B.S. (General) 1957, B.S. (Special) 1958, M.S. 1959, Ph.D. 1962, National University of Ireland

Michael Scott Castleberry, *Associate Professor of Special Education*
B.A. 1966, University of North Carolina; M.A. in Ed. 1972, Ed.D. 1973, George Washington University

Bayard Lacey Catron, *Associate Professor of Public Administration*
B.A. 1963, Grinnell College; M.A. 1965, University of Chicago; M.C.P. 1972, Ph.D. 1975, University of California, Berkeley

Soo Young Cha, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1961, Seoul National University

Fenner Albert Chace, Jr., *Adjunct Professor of Biological Sciences*
B.A. 1930, M.A. 1931, Ph.D. 1934, Harvard University

Charles McKay Chambers, *Associate Professorial Lecturer in Mathematics*
B.S. 1962, M.S. 1963, Ph.D. 1964, University of Alabama; J.D. 1976, George Washington University

Jonathan Chaves, *Visiting Assistant Professor of Chinese*
B.A. 1965, City University of New York, Brooklyn College; M.A. 1966, Ph.D. 1971, Columbia University

Cara Chell, *Lecturer in English*
B.A. 1972, Butler University; M.A. 1977, DePaul University

Stephen Reed Chitwood, *Professor of Public Administration*
B.A. 1962, University of Colorado; M.P.A. 1965, Ph.D. 1966, University of Southern California; J.D. 1977, George Washington University

Yang-Ming Chu, *Associate Research Professor of Microbiology*
B.S. 1959, University of Washington; M.S. 1964, Ph.D. 1967, George Washington University

*Robert Paul Churchill, *Assistant Professor of Philosophy*
B.A. 1969, M.A. 1972, Ph.D. 1974, Johns Hopkins University

Ira Hubert Cisin, *Professor of Sociology*
B.S. 1939, New York University; M.A. 1951, Ph.D. 1957, American University

Astere Evarist Claeyssens, Jr., *Associate Professor of English*
B.A. 1948, University of Illinois; M.A. 1952, Columbia University

James E. Clair, *Lecturer in Health Services Administration*
B.S. 1967, University of Detroit; M.B.A. 1971, Xavier University

Charles Frederick Cleland, *Professorial Lecturer in Biological Sciences*
B.A. 1961, Wabash College; Ph.D. 1967, Stanford University

Betty Jo Clifford, *Clinical Instructor in Art Therapy*
M.S. in Art Ed. 1965, State University of New York at Buffalo

*On sabbatical leave academic year 1981-82.

Anthony George Coates, *Professor of Geology*
B.S. 1959, Ph.D. 1963, University of London

Joseph Francis Coates, *Professorial Lecturer in Public Affairs*
B.S. 1951, Polytechnic Institute of New York; M.S. 1953, Pennsylvania State University

Mary Ann Bieter Coffland, *Associate Professor of Romance Languages*
B.A. 1952, College of St. Catherine; M.A. 1957, Ph.D. 1965, University of Minnesota

Neil G. Cohen, *Assistant Professor of Business Administration*
B.A. 1963, Olivet College; M.B.A. 1964, University of Michigan; D.B.A. 1975, University of Virginia

Stanley Lee Cohen, *Professorial Lecturer in Psychology*
B.A. 1963, M.A. 1966, Ph.D. 1971, George Washington University

Steven Bruce Cohen, *Assistant Professorial Lecturer in Health Services Administration*
B.A. 1973, City University of New York, Brooklyn College; M.S. 1976, Ph.D. 1978, University of North Carolina

Victor Hugo Cohn, *Professor of Pharmacology*
B.S. 1952, Lehigh University; M.A. 1954, Harvard University; Ph.D. 1961, George Washington University

James Coldsmith, *Professorial Lecturer in Journalism*
B.A. 1950, Baker University; M.S.J. 1951, Northwestern University

Frederick Joseph Collier, *Assistant Professorial Lecturer in Geology*
B.S. 1958, Tufts University

Robert Long Combs, *Assistant Professor of English*
B.A. 1968, University of Southern Mississippi; Ph.D. 1971, University of South Carolina

David Casserly Cooke, *Lecturer in Business Administration*
B.S. 1968, University of Maryland; M.B.A. 1979, George Washington University

Joseph John Cordes, *Associate Professor of Economics*
B.A. 1971, Stanford University; M.S. 1975, Ph.D. 1977, University of Wisconsin

Erminio Costa, *Professorial Lecturer in Pharmacology*
M.D. 1947, University of Cagliari, Italy

Constance Christian Costigan, *Assistant Professor of Design*
B.S. 1957, Simmons College; M.A. 1965, American University

Raymond Sheary Cottrell, Jr., *Professor of Special Education*
B.S. 1955, State University of New York at Albany; M.S. 1959, Ed.D. 1967, Syracuse University

Raymond Leslie Courage, *Associate Professorial Lecturer in Journalism*
B.A. 1949, M.A. 1951, University of Michigan

Thomas Francis Courtless, Jr., *Professor of Law and Sociology*
B.A. 1955, Pennsylvania State University; M.A. 1960, Ph.D. 1966, University of Maryland

Carl Daniel Cox, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1976, University of Maryland

John Patrick Coyne, *Associate Professor of Management Science*
B.S. 1967, Iona College; M.S. 1968, Ph.D. 1970, Lehigh University

Martha B. Cramer, *Adjunct Instructor in English*
B.A. 1969, Ohio Wesleyan University; M.Ed. 1972, Rutgers—The State University

Pamela J. Cressey, *Assistant Professorial Lecturer in American Civilization and in Anthropology*
B.A. 1968, University of California, Los Angeles; M.A. 1973, Ph.D. 1978, University of Iowa

Theodore Oscar Cron, *Associate Professorial Lecturer in Journalism*
B.A. 1952, M.A.T. 1954, Harvard University

Gary Edward Crum, *Assistant Professor of Health Services Administration*
B.S. 1967, College of William and Mary; M.S. 1969, Ph.D. 1972, University of Kentucky
M.P.H. 1973, Columbia University

Michèle Schiavone Cruz-Sáenz, *Assistant Professor of Romance Languages*
B.A. 1971, Connecticut College; M.A. 1974, Ph.D. 1976, University of Pennsylvania

Ronald Crystal, *Adjunct Professor of Genetics*
B.A. 1962, Tufts University; M.S. 1963, M.D. 1968, University of Pennsylvania

Jonathan Walkley Cummings, *Associate Clinical Professor of Psychology*
B.A. 1949, University of Vermont; Ph.D. 1954, University of Illinois

Marcus Falkner Cunliffe, *University Professor*
B.A. 1944, M.A. 1946, B.Litt. 1947, Oxford University; M.A. 1963, University of Manchester; D.H.L. 1976, University of Pennsylvania; D.H.L. 1979, New England College

Cortlandt Beck Cunningham, *Professorial Lecturer in Forensic Sciences*
B.S. 1948, Northwestern University; J.D. 1954, Miami University; M.S. 1971, George Washington University

Phyllis Deutsch Daen, *Associate Clinical Professor of Psychology*
B.S. 1950, City University of New York, Queens College; Ph.D. 1960, Adelphi University

Dean Howard Dalton, *Studio Lecturer in Applied Music (Voice)*
B.A. 1968, Mus.B. 1968, Mus.M. 1971, University of Arkansas

Dwight David Darland, *Professorial Lecturer in Education*
B.S. 1939, Nebraska State Teachers College; M.A. 1942, University of Wyoming; Ed.D. 1947, Columbia University

Kurt John Darr, *Professor of Health Services Administration*
B.A. 1961, Concordia College, Minnesota; J.D. 1964, M.H.A. 1966, University of Minnesota; D.Sc. 1973, Johns Hopkins University

Philip Gardner Davidoff, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, M.A. 1963, University of Pennsylvania

Audrey B. Davis, *Professorial Lecturer in History*
B.S. 1956, Adelphi University; Ph.D. 1969, Johns Hopkins University

Herbert John Davis, *Associate Professor of Business Administration*
B.S. 1965, Villanova University; M.B.A. 1968, East Carolina University; Ph.D. 1974, Louisiana State University

Roderic Hollett Davison, *Professor of European History*
B.A. 1937, Princeton University; M.A. 1938, Ph.D. 1942, Harvard University

Christopher J. Deering, *Assistant Professor of Political Science*
B.A. 1974, University of Southern California; M.A. 1975, Ph.D. 1979, University of California, Santa Barbara

Rosalie Frances De Giovanni-Donnelly, *Associate Professorial Lecturer in Microbiology*
B.A. 1947, M.A. 1953, City University of New York, Brooklyn College; Ph.D. 1961, Columbia University

William Charles DeMull, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1972, Michigan State University

Frank Landt Dennis, *Professorial Lecturer in Journalism*
B.A. 1929, University of Oklahoma; LL.B. 1935, Harvard University

Linda Grant DePauw, *Professor of American History*
B.A. 1961, Swarthmore College; Ph.D. 1964, Johns Hopkins University

Malinee Peris DeSilva, *Studio Lecturer in Applied Music (Piano)*
Licentiate 1946, 1947, Trinity College of Music, England; Licentiate 1950, Royal Academy of Music, England

Milton Charles Devolites, *Professor of Health Services Administration*
B.A. 1938, Harvard University; M.A. 1953, Baylor University

Jessie Carleton Calver Dickens, *Associate Professorial Lecturer in Biological Sciences*
B.A. 1939, M.S. 1969, George Washington University

Antoinette LaVerne Dickerson, *Associate Research Professor of Human Kinetics and Leisure Studies*
B.S. 1958, Virginia State College; M.A. 1959, Ed.D. 1973, New York University

Thomas Dietz, *Assistant Professor of Sociology*
B.Gen.St. 1972, Kent State University; Ph.D. 1979, University of California, Davis

Salvatore Frank Divita, *Professor of Business Administration*
B.I.E. 1953, New York University; M.B.A. 1956, Ohio State University; D.B.A. 1968, Harvard University

Douglas S. Dixon, *Associate Professorial Lecturer in Forensic Sciences*
M.D. 1971, University of Virginia

John K. Donaldson, Jr., *Adjunct Instructor in English*
B.A. 1956, University of Rochester; M.A. 1957, Middleburg College; M.S. 1980, Georgetown University

Robert Paul Donaldson, *Assistant Professor of Biology*
B.A. 1964, University of Texas; M.S. 1966, Miami University; Ph.D. 1971, Michigan State University

Linda Anne Donnels, *Lecturer in Education*
B.S. 1970, Ohio State University; M.A. 1976, Gallaudet College

Miriam Violet Wein Dow, *Assistant Professorial Lecturer in English*
B.A. 1959, University of Akron; M.A. 1960, University of Michigan; Ph.D. 1977, University of Maryland

Daniel Maccabaeus Dribin, *Professorial Lecturer in Mathematics*
B.S. 1933, M.S. 1934, Ph.D. 1936, University of Chicago

Robert Martin Dunn, Jr., *Professor of Economics*
B.A. 1960, Williams College; M.A. 1963, Ph.D. 1967, Stanford University

Robert Frederick Dyer, *Professor of Business Administration*
B.S. in B.A. 1965, M.B.A. 1966, Bowling Green State University; D.B.A. 1972, University of Maryland

John Joseph Dziak, *Professorial Lecturer in International Affairs*
B.A. 1961, M.A. 1964, Seton Hall University; Ph.D. 1971, Georgetown University

Elizabeth M. Earley, *Adjunct Associate Professor of Genetics*
B.S. 1953, Chestnut Hill College; M.S. 1968, Ph.D. 1971, Tulane University

Roy Brandon Eastin, *Professor of Business Administration*
B.A. 1943, M.A. 1945, George Washington University; Ph.D. 1953, American University

Russell Eaton III, *Assistant Professorial Lecturer in Physics*
B.A. 1962, M.A. 1964, Miami University; Ph.D. 1974, George Washington University

Ellen W. Echeverria, *Adjunct Instructor in English*
B.A. 1963, Fairleigh Dickinson University; M.A. 1969, Middlebury College

Ralph Peter Eckerlin, *Associate Professorial Lecturer in Biological Sciences*
B.A. 1960, Rutgers—The State University; M.S. 1962, University of Miami; Ph.D. 1975, University of Connecticut

William Henry Eddy, *Lecturer in Special Education*
B.S. 1969, St. Cloud University; M.A. 1974, George Washington University

David Lee Edgell, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1961, University of Kansas; B.A. 1968, American University; M.A. 1970, Indiana University; Ph.D. 1976, University of Cincinnati

John Eftis, *Professor of Engineering and Applied Science and Adjunct Professor of Mathematics*
B.C.E. 1952, City University of New York, City College; M.S. in C.E. 1958, Columbia University; D.Sc. 1967, George Washington University

*Julian Eisenstein, *Professor of Physics*
B.S. 1941, M.A. 1942, Ph.D. 1948, Harvard University

Adel El-Ansary, *Professor of Business Administration*
B.Com. 1962, Cairo University, Egypt; M.B.A. 1968, Ph.D. 1970, Ohio State University

Marlene Kay Elbin, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1967, University of Maryland

Robert Moore Eldridge, *Lecturer in Business Administration*
B.S. 1960, U.S. Naval Academy; M.S. in Adm. 1975, George Washington University

Rodney Eldridge, *Professor of International Finance*
B.A. 1949, M.A. 1959, University of Vermont; Ph.D. 1966, Columbia University

Charles Fox Elliott, *Associate Professor of Political Science and International Affairs*
B.A. 1953, Ph.D. 1964, Harvard University; M.A. 1958, University of California, Berkeley

Lloyd Hartman Elliott, *Professor of Higher Education; President of the University*
B.A. 1937, Glenville State College; M.A. 1939, LL.D. 1967, West Virginia University; Ed.D. 1948, University of Colorado; LL.D. 1963, University of New Hampshire; LL.D. 1965, Colby College; LL.D. 1966, Concord College; LL.D. 1969, University of Maine at Orono; LL.D. 1971, Georgetown University

Stefanie Robin Endler, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1967, Emerson College; M.S. 1976, City University of New York, Hunter College

* On sabbatical leave spring semester 1982.

Richard Ferdinand Ericson, *Professor of Management*
B.A. 1943, M.B.A. 1948, University of Chicago; Ph.D. 1952, Indiana University

Amitai Etzioni, *University Professor*
B.A. 1954, M.A. 1956, Hebrew University; Ph.D. 1958, University of California, Berkeley

Audrey Jane Evans, *Lecturer in Art Therapy*
B.A. 1971, Keene State College; M.A. 1977, George Washington University

Dorothy Alita Evans, *Associate Clinical Professor of Psychology*
B.S. 1963, University of Illinois; M.A. 1966, Ph.D. 1968, Southern Illinois University

Grace Elizabeth Orvis Evans, *Professorial Lecturer in Art*
B.A. 1943, M.A. 1946, University of Minnesota

Grose Evans, *Adjunct Associate Professor of Art*
B.F.A. 1939, M.A. 1940, Ohio State University; Ph.D. 1953, Johns Hopkins University

Marilyn Jane Evans, *Associate Professorial Lecturer in Chinese*
B.A. 1958, Middlebury College; Ph.D. 1965, Yale University

Donald Frank Eversmann, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1967, Cornell University; M.B.A. 1972, Southern Illinois University

Sergio Egidio Fabro, *Professor of Obstetrics and Gynecology and Research Professor of Pharmacology*
M.D. 1956, University of Milan; Ph.D. 1966, Ph.D. 1968, University of Rome; Ph.D. 1967, University of London

Heather Christine Faulkner, *Assistant Professorial Lecturer in English*
B.A. 1957, University of Birmingham, England; M.A. 1970, Ph.D. 1977, George Washington University

Joseph Fehrenbach, *Assistant Professorial Lecturer in Geography and Regional Science*
B.A. 1974, University of Delaware; M.A. 1977, University of Georgia

Bernice Feinstein, *Assistant Professorial Lecturer in Music*
B.A. 1947, Smith College; M.A. 1958, Ed.D. 1972, Columbia University

Reynolds Ferrante, *Professor of Education*
B.S. 1957, Glassboro State College; M.Ed. 1961, Rutgers—The State University; Ed.D. 1974, Pennsylvania State University

Sima Ficks, *Assistant Professorial Lecturer in Russian*
Diploma 1964, Kiev State University

Cynthia Field, *Associate Professorial Lecturer in American Civilization*
B.A. 1963, Bryn Mawr College; M.A. 1967, Ph.D. 1974, Columbia University

Jonathan D. Fife, *Associate Professor of Education*
B.B.A. 1965, University of Massachusetts; M.B.A. 1967, University of Cincinnati; M.S. 1970, State University of New York at Albany; Ed.D. 1975, Pennsylvania State University

Nicolae Filipescu, *Professor of Chemistry*
Ph.D. 1957, University of Industrial Chemistry, Polytechnical Institute, Rumania; Ph.D. 1964, M.D. 1975, George Washington University

Penelope Peterson Fischer, *Studio Lecturer in Applied Music (Flute)*
Mus.B. 1966, University of Iowa; Mus.M. 1970, University of Michigan

Elizabeth Ann Fisher, *Associate Professor of Classics*
B.A. 1966, Northwestern University; M.A. 1971, Ph.D. 1972, Harvard University

Sadie Fishman, *Clinical Instructor in Art Therapy*
B.F.A. 1974, Maryland Institute College of Art; M.A. 1975, George Washington University

Allan Kress Fitzsimmons, *Associate Professor of Geography and Regional Science*
B.A. 1965, M.A. 1969, California State University, Northridge; Ph.D. 1975, University of California, Los Angeles

Marilyn Fleming, *Adjunct Assistant Professor of Art Therapy*
B.F.A. 1954, University of Illinois; M.A. 1975, George Washington University

John Raymond Fogarty, *Associate Professorial Lecturer in Journalism*
B.S. 1966, University of Baltimore

Vincy Fon, *Assistant Professor of Economics*
B.A. 1971, Wisconsin State University; M.A. 1975, M.A. 1977, University of Kansas

William Robert Fonda, *Associate Professorial Lecturer in Journalism*

Deborah A. Ford, *Assistant Professorial Lecturer in Business Administration*
B.A. 1969, M.A. 1970, University of Florida; M.B.A. 1977, Ph.D. 1979, University of Pennsylvania

Ernest Harvey Forman, *Associate Professor of Management Science*
B.S. 1964, University of Rochester; M.S. 1969, Johns Hopkins University; D.Sc. 1975, George Washington University

John Davidson Frame, *Assistant Professor of Management Science*
B.A. 1967, College of Wooster; M.A. 1969, Ph.D. 1976, American University

Suzanne G. Frayser, *Assistant Professorial Lecturer in Anthropology*
B.A. 1965, College of William and Mary; M.A. 1968, Ph.D. 1976, Cornell University

Douglas Carleton Frechtling, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1965, Hamilton College; M.Phil. 1970, Ph.D. 1973, George Washington University

John Eric Fredland, *Associate Professorial Lecturer in Economics*
B.A. 1964, Harvard University; M.A. 1966, Ph.D. 1970, University of Michigan

Richard E. French, *Associate Professorial Lecturer in Economics*
B.B.A. 1961, M.A. 1963, Ph.D. 1967, University of Oklahoma

Roderick Stuart French, *Professor of Philosophy; Director, Division of Experimental Programs*
B.A. 1954, Kenyon College; B.D. 1957, Episcopal Theological School; S.T.M. 1965, Union Theological Seminary; Ph.D. 1971, George Washington University

Maxine Benjamin Freund, *Research Instructor in Special Education*
B.A. 1968, University of Minnesota; M.A. 1973, George Washington University

Thomas Freund, *Visiting Special Lecturer in Chemistry*
B.A. 1947, Princeton University; Ph.D. 1952, Catholic University of America

John Andrew Frey, *Professor of Romance Languages*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Catholic University of America

R. Scott Frey, *Assistant Professor of Sociology*
B.S. 1973, Northwest Missouri State University; M.A. 1976, Drake University; Ph.D. 1980, Colorado State University

Joy Frieman, *Assistant Professorial Lecturer in English*
B.A. 1950, Columbia University; M.A. 1952, University of Rochester; Ph.D. 1980, Rutgers—The State University

Gary Ira Friend, *Lecturer in Business Administration*
B.B.A. 1979, M.B.A. 1979, George Washington University

Stephen Souther Fuller, *Professor of Urban Planning*
B.A. 1962, Rutgers—The State University; M.C.P. 1964, University of Mississippi; Ph.D. 1968, Cornell University

Carol Susan Jonas Gage, *Lecturer in Education*
B.A. 1968, Finch College; M.A. 1970, New York University; M.A. in Ed. 1974, George Washington University

Dennis Gale, *Assistant Professor of Urban and Regional Planning*
B.A. 1964, Bucknell University; M.S. 1968, Boston University; M.Ed. 1969, Harvard University; M.C.P. 1971, University of Pennsylvania

Michael Graham Gallagher, *Professor of Accounting*
B.A. in Govt. 1960, J.D. 1964, LL.M. 1971, George Washington University; C.P.A. 1965, State of Virginia

Linda Lou Gallo, *Associate Professor of Biochemistry*
B.S. 1959, West Virginia University; M.S. 1963, Ph.D. 1969, George Washington University

Robert Charles Gallo, *Adjunct Professor of Genetics*
B.A. 1959, Providence College; M.D. 1963, Thomas Jefferson University

Benson E. Gammon, *Lecturer in Mathematics*
B.S. 1940, University of Virginia; M.S. 1947, Case Western Reserve University

Robert Norton Ganz, Jr., *Professor of English*
B.A. 1949, M.A. 1951, Ph.D. 1959, Harvard University

Eleanor Radcliffe Garner, *Assistant Professorial Lecturer in English*
B.A. in Ed. 1939, M.A. in Ed. 1941, George Washington University; M.S. 1968, Ph.D. 1975, Georgetown University

Nathan Conant Garner, *Assistant Professor of Drama; Director of Theater*
B.A. 1963, Tufts University; M.A. 1966, University of North Carolina

Carleton Theodore Garrett, *Associate Professor of Pathology*
B.A. 1962, Lehigh University; M.D. 1966, Johns Hopkins University; Ph.D. 1977, University of Wisconsin

Marilyn Mangold Garst, *Studio Lecturer in Applied Music (Piano)*
Mus.B. 1962, University of Southern California; Mus.M. 1964, Indiana University; Ph.D. 1972, Michigan State University

Joseph Lewis Gastwirth, *Professor of Statistics and Economics*
B.S. 1958, Yale University; M.A. 1960, Princeton University; Ph.D. 1963, Columbia University

Harry Irving Gates, *Associate Professor of Sculpture*
B.F.A. 1958, M.F.A. 1960, University of Illinois

Alfonso Geiger, *Associate Professorial Lecturer in Geology*
B.S. 1950, University of Michigan

Alan Harold Gelb, *Associate Professorial Lecturer in Economics*
B.S. 1968, University of Natal; B.Phil. 1971, Oxford University

Lyndale Harpster George, *Associate Professor of Human Kinetics and Leisure Studies*
B.S. in P.E. 1948, M.A. in Ed. 1952, A.P.C. 1961, George Washington University

Fariborz Ghadar, *Associate Professor of Business Administration*
B.S.(C.E.) 1968, B.S. 1969, M.S.(M.E.) 1970, Massachusetts Institute of Technology; M.B.A. 1972, D.B.A. 1975, Harvard University

Phyllis Eleanor Gieseler, *Studio Lecturer in Applied Music (Voice)*

Howard Frank Gillette, Jr., *Associate Professor of American Civilization*
B.A. 1964, Ph.D. 1970, Yale University

Leon Gintzig, *Professor of Hospital Administration; Associate Dean of the School of Government and Business Administration*
B.S. 1947, Boston University; M.S. 1954, Northwestern University; Ph.D. 1958, University of Iowa

Bruce Willard Given, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1959, Kansas State University; M.S.F.S. 1975, George Washington University

Audrey L. Glassman, *Assistant Professorial Lecturer in Art*
B.F.A. 1946, Syracuse University; M.F.A. 1975, American University

Bernard Sholom Glassman, *Associate Professorial Lecture in Art*
B.S. 1943, Harvard University

Irving Isadore Glick, *Associate Professor of Mathematics*
B.A. 1953, Johns Hopkins University; Ph.D. 1961, University of Maryland

Leo R. Goldbaum, *Professorial Lecturer in Forensic Sciences*
B.S. 1934, City University of New York, Brooklyn College; M.S. 1938, New York University; Ph.D. 1950, George Washington University

Joe Jeff Goldblatt, *Lecturer in Human Kinetics and Leisure Studies*
B.F.A. 1974, St. Edward's University

Robert Stanley Goldfarb, *Professor of Economics*
B.A. 1964, Columbia University; M.A. 1965, M.Phil. 1967, Ph.D. 1968, Yale University

Allan L. Goldstein, *Professor of Biochemistry*
B.S. 1959, Wagner College; M.S. 1961, Ph.D. 1964, Rutgers—The State University

Victor Karl Golla, *Associate Professor of Anthropology*
B.A. 1960, Ph.D. 1970, University of California, Berkeley

Charles Vance Gordon, Jr., *Associate Professorial Lecturer in Health Services Administration*
B.A. 1967, University of Colorado; Ph.D. 1971, Washington University

Marvin Gordon, *Professor of Geography and Regional Science*
B.A. 1942, City University of New York, City College; M.A. 1954, Ph.D. 1966, Columbia University

Padma Canchi Gotur, *Assistant Professor of Economics*
B.S. 1974, University of Madras, India; M.Phil 1979, George Washington University

Lois Graff, *Associate Professor of Management Science*
B.A. 1964, Mundelein College; M.S. 1965, Ph.D. 1969, New York University; M.B.A. 1979, University of Illinois

William D. Greaf, *Assistant Research Professor of Health Services Administration*
B.S. 1967, Butler University; M.B.A. 1974, George Washington University

*Marvin David Green, *Associate Professor of Mathematics*
B.S. 1961, M.A. 1962, Ph.D. 1965, University of Cincinnati

Susan Kay Green, *Associate Professor of Psychology*
B.A. 1971, Michigan State University; M.A. 1973, Ph.D. 1975, Loyola University of Chicago

Joseph Arthur Greenberg, *Associate Professor of Education*
B.S. in Bus. Ed. 1966, Salem State College; Ed.M. 1968, Ed.D. 1974, Boston University

Sherwin Greene, *Associate Professor of Urban Planning*
B.Arch. 1959, M.S. in C.R.P. 1960, Illinois Institute of Technology

†Samuel W. Greenhouse, *Professor of Statistics*
B.S. 1938, City University of New York, City College; M.A. 1954, Ph.D. 1959, George Washington University

Fuller Griffith, *Assistant Professor of Graphics*
B.S. 1952, University of Wisconsin; M.F.A. 1969, George Washington University

William Byron Griffith, *Associate Professor of Philosophy*
B.A. 1958, University of Notre Dame; M.A. 1962, Ph.D. 1963, Yale University

Phillip Donald Grub, *Aryamehr Professor of Multinational Management*
B.A., B.A. in Ed. 1953, Eastern Washington State College; M.B.A. 1960, D.B.A. 1964, George Washington University

Francis Stanley Grubar, *Professor of Art*
B.A. 1948, M.A. 1949, University of Maryland; M.A. 1952, Ph.D. 1966, Johns Hopkins University

Joseph Grunwald, *Adjunct Professor of Economics*
B.S. 1943, Johns Hopkins University; Ph.D. 1950, Columbia University

Eileen Morris Guenther, *Studio Lecturer in Applied Music (Organ)*
B.A., Mus.B. 1970, University of Kansas; M.A., D.M.A. 1973, Catholic University of America

Roy James Guenther, *Assistant Professor of Music*
B.Mus.Ed. 1966, Mus.B. 1968, University of Kansas; M.A. 1974, Ph.D. 1979, Catholic University of America

Murli Manohar Gupta, *Assistant Professor of Mathematics*
B.S. 1963, M.S. 1965, Agra University, India; M.S. 1969, Ph.D. 1971, University of Saskatchewan, Canada

Andrew Gyorgy, *Professor of International Affairs and Political Science*
B.A. 1937, J.D. 1938, University of Budapest; M.A. 1939, University of California, Berkeley; Ph.D. 1943, University of California, Los Angeles

Sheldon Edward Haber, *Professor of Economics*
B.A. 1954, City University of New York, City College; Ph.D. 1958, Johns Hopkins University

John T. Hack, *Professorial Lecturer in Geology*
B.A. 1935, M.A. 1938, Ph.D. 1940, Harvard University

Eleanor Martha Hadley, *Adjunct Professor of Economics*
B.A. 1938, Mills College; M.A. 1943, Ph.D. 1949, Harvard University

Neil Blaine Hadley, *Associate Professorial Lecturer in Health Services Administration*
B.A. 1949, University of Northern Iowa; M.H.A. 1958, Baylor University; M.S. 1962, Arizona State University; D.B.A. 1971, George Washington University

Robert Arthur Hadley, *Associate Professor of History*
B.A. 1959, Bowdoin College; M.A. 1960, Ph.D. 1964, University of Pennsylvania

E. William Hahn, *Associate Professor of Management Science*
B.S. 1963, M.S. 1965, Ph.D. 1969, Purdue University

William Emitt Halal, *Associate Professor of Management Science*
B.S. 1956, Purdue University; M.B.A. 1970, Ph.D. 1971, University of California, Berkeley

Max Halperin, *Research Professor of Statistics*
B.S. 1940, University of Omaha; M.S. 1941, University of Iowa; Ph.D. 1950, University of North Carolina

William Charles Handorf, *Professor of Business Administration*
B.A. 1966, M.B.A. 1967, University of Michigan; Ph.D. 1973, Michigan State University

William Walter Hardgrave, *Associate Professor of Management Science*
B.A. 1959, Princeton University; D.Engr. 1962, Johns Hopkins University

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* On sabbatical leave fall semester 1981.
† On sabbatical leave academic year 1981-82.

John Hardt, *Adjunct Professor of Economics*
B.A. 1945, M.A. 1948, University of Washington; M.A. 1950, Ph.D. 1955, Columbia University

Michael Mont Harmon, *Associate Professor of Public Administration*
B.A. 1963, Utah State University; M.P.A. 1966, Ph.D. 1968, University of Southern California

Edmund Patrick Harper, *Associate Professor of Physics*
B.S. 1965, University College, Dublin; M.S. 1969, Ph.D. 1972, Purdue University

Jeffrey Harris, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1965, New York University; J.D. 1968, Syracuse University

Jerry Harvey, *Professor of Management Science*
B.B.A. 1957, Ph.D. 1963, University of Texas

Shahin Hashtroudi, *Assistant Professor of Psychology*
B.A. 1971, American University of Beirut; Ph.D. 1976, State University of New York at Stony Brook

*Richard Catlin Haskett, *Professor of American History*
B.A. 1940, M.A. 1941, Indiana University; M.A. 1948, Ph.D. 1952, Princeton University

Myron Edwin Hatcher, *Visiting Assistant Professor of Health Services Administration*
B.S. in M.E. 1968, University of Toledo; M.S.E. 1972, University of Michigan; M.P.H. 1975, Sc.D. 1977, Johns Hopkins University

Gertrude Haugan, *Clinical Instructor in Art Therapy*
B.A. 1952, M.A. 1956, George Washington University; Ph.D. 1970, University of Maryland

Declan Charles Haun, *Associate Professorial Lecturer in Journalism*

Oli Havrylyshyn, *Associate Professor of Economics*
B.A. 1966, Queen's University, Canada; Ph.D. 1972, Massachusetts Institute of Technology

Donald Hawkins, *Professor of Human Kinetics and Leisure Studies and Research Professor of Medicine*
B.A. 1958, King's College, Pennsylvania; M.A. 1960, Lehigh University; Ed.D. 1967, New York University

George M. Hayes, Jr., *Assistant Professorial Lecturer in English*
B.A. 1968, Stetson University; M.A. 1973, Georgia State University; Ph.D. 1979, University of Florida

Patrick Louis Hayes, *Professorial Lecturer in Mathematics*
B.S. 1970, M.S. 1971, D.A. 1973, Carnegie-Mellon University

Janet Craig Heddesheimer, *Associate Professor of Education*
B.A. 1965, Coe College; M.A. 1968, Ph.D. 1971, Ohio State University

Arnost Heidrich, *Associate Professorial Lecturer in Mathematics*
B.S. 1962, George Washington University; M.A. 1966, Ph.D. 1978, University of Maryland

James T. Heisler, *Associate Professorial Lecturer in Business Administration*
B.A. 1968, University of Michigan; M.A. 1970, DePaul University; Ph.D. 1974, Illinois Institute of Technology

Jeffrey R. Henig, *Assistant Professor of Political Science*
B.A. 1973, Cornell University; Ph.D. 1977, Northwestern University

Dagmar Renate Kirshner Henney, *Associate Professor of Mathematics*
B.S. 1954, M.S. 1956, University of Miami; Ph.D. 1964, University of Maryland

Charles Joseph Herber, *Associate Professor of European History*
B.A. 1952, Dickinson College; M.A. 1957, Ph.D. 1965, University of California, Berkeley

Gilbert Richard Herer, *Professorial Lecturer in Speech and Professor of Child Health and Development*
B.S. 1953, M.S. 1954, Syracuse University; Ph.D. 1964, Northwestern University

Susan Hertz, *Associate Professorial Lecturer in Anthropology*
B.A. 1968, Stanford University; M.A. 1969, Ph.D. 1974, University of Minnesota

Julia Elizabeth Hicks, *Assistant Professor of Spanish*
B.A. 1946, M.A. 1947, University of Tennessee, Knoxville

*Philip Henry Highfill, Jr., *Professor of English*
B.A. 1942, Wake Forest University; M.A. 1948, Ph.D. 1950, University of North Carolina

Peter Proal Hill, *Professor of History*
B.A. 1949, Tufts University; M.A. 1954, Boston University; Ph.D. 1966, George Washington University

* On sabbatical leave spring semester 1982.

James William Hillis, *Professor of Speech; Director, Speech Pathology and Audiology*
B.S. 1952, University of Nebraska; M.A. 1957, University of Maryland; Ph.D. 1963, Ohio State University

Joseph Hilmy, *Professorial Lecturer in Accounting*
B.Com. 1947, M.S. 1954, Ph.D. 1959, University of Aberdeen

*Alfred John Hiltebeitel, *Professor of Religion*
B.A. 1963, Haverford College; M.A. 1966, Ph.D. 1973, University of Chicago

Harold Clendenin Hinton, *Professor of Political Science and International Affairs*
B.A. 1946, M.A. 1948, Ph.D. 1951, Harvard University

Harold Lester Hirsh, *Professorial Lecturer in Health Services Administration*
M.D. 1942, Georgetown University; J.D. 1972, American University

Denis Michael Hitchcock, *Associate Professor of Art*
B.A. 1967, University of California, Los Angeles; M.F.A. 1970, Ph.D. 1977, Princeton University

Herman Hedberg Hobbs, *Professor of Physics*
B.S. 1953, M.S. 1955, George Washington University; Ph.D. 1958, University of Virginia

Harold A. Hoffman, *Professorial Lecturer in Biological Sciences*
B.S. 1957, M.A. 1960, Ph.D. 1962, University of California, Berkeley

Robert Lee Holland, *Associate Professor of Management Science; Dean of the College of General Studies*
B.S. 1951, M.S. 1956, University of Tennessee, Knoxville; Ph.D. 1960, Texas A&M University

†Mary Alida Holman, *Professor of Economics*
B.A. 1955, M.A. 1957, Ph.D. 1963, George Washington University

Dennis Howard Holmes, *Assistant Professorial Lecturer in Education*
B.A. 1962, California State University, San Jose; M.A. 1971, Wayne State University; D.Ed. 1978, University of Southern California

Robert William Holmstrom, *Associate Professor of Psychology*
B.A. 1956, Trinity College, Connecticut; Ph.D. 1965, Duke University

Assad Homayoun, *Visiting Professor of International Affairs*
B.A. 1961, University of Tehran; M.Phil. 1967, Karachi University; M.Phil. 1972, Ph.D. 1972, George Washington University

William Duane Hope, *Adjunct Associate Professor of Biological Sciences*
B.S. 1957, M.S. 1960, Colorado State University; Ph.D. 1964, University of California, Davis

Gloria Lyon Horrworth, *Professor of Education*
B.A. 1952, California State University, Los Angeles; M.A. 1961, California State University, Northridge; Ed.D. 1972, American University

*James O. Horton, *Associate Professor of American History and Civilization*
B.A. 1964, State University of New York at Buffalo; M.A. 1970, University of Hawaii; Ph.D. 1973, Brandeis University

Nicholas Hotton, *Professorial Lecturer in Geology*
B.S. 1947, Ph.D. 1950, University of Chicago

Edmund G. Howe, *Professorial Lecturer in Forensic Sciences*
B.A. 1966, Yale University; M.D. 1970, Columbia University; J.D. 1976, Catholic University of America

Joseph T. Howell, *Banneker Professor of Washington Studies*
B.S. 1964, Davidson College; M.Th. 1968, Union Theological Seminary; M.S. 1970, University of North Carolina

Thomas Richard Howie, *Associate Professorial Lecturer in Education*
B.S. 1963, Frostburg State College; M.Ed. 1967, University of Maryland; Ed.D. 1972, George Washington University

‡Ching-Yao Hsieh, *Professor of Economics*
B.A. 1939, St. John's University, China; M.A. 1958, Ph.D. 1964, George Washington University

Kun-yen Huang, *Professor of Microbiology*
M.D. 1959, National Taiwan University; Ph.D. 1967, George Washington University

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* On sabbatical leave academic year 1981-82.
† On sabbatical leave spring semester 1982.
‡ On sabbatical leave fall semester 1981.

Houlder Howard Hudgins, Jr., *Assistant Professorial Lecturer in Art*
B.S. 1970, Virginia Commonwealth University; M.F.A. 1978, George Washington University

Maxwell White Hudgins, Jr., *Assistant Professorial Lecturer in Business Administration*
B.S. 1965, Ph.D. 1973, University of Virginia

Terry Lee Hufford, *Associate Professor of Botany*
B.S. 1961, M.A. 1962, Bowling Green State University; Ph.D. 1972, Ohio State University

Rudolph Hugh, *Professor of Microbiology*
B.S. 1948, Michigan State University; Ph.D. 1954, Loyola University of Chicago

Thomas Louis Hughes, *Assistant Professorial Lecturer in Geology*
B.S. 1958, University of Oklahoma

Edwin Lee Hullander, *Visiting Associate Professor of Business Administration*
B.S. 1960, Tennessee Technological University; M.S. 1969, M.S. 1971, Ph.D. 1972, Iowa State University

John Paul Hume, *Associate Professorial Lecturer in Forensic Sciences*
B.B.A. 1964, University of Notre Dame; J.D. 1970, George Washington University

*Robert Lee Humphrey, Jr., *Professor of Anthropology*
B.A. 1962, American University; Ph.D. 1970, University of New Mexico

Candice Hart Hunt, *Adjunct Assistant Professor of English*
B.A. 1972, George Washington University; M.A. 1975, University of Pennsylvania

Alain E. Callis Hunter, *Assistant Research Professor of Special Education*
B.S. 1973, M.Ed. 1974, Pennsylvania State University; Ed.D. 1980, University of Illinois

Gérard Paul Huvé, *Assistant Professor of French*
B.A. 1963, American University; M.A. 1969, University of Maryland

Robert Nicholas Ianacone, *Assistant Professor of Special Education*
B.S 1968, M.S. 1971, State University of New York at Buffalo; Ed.D. 1976, University of Florida

Norman Murray Irvine, *Studio Lecturer in Applied Music (Bass)*
B.S. in Mus.Ed. 1955, M.Ed. in Mus.Ed. 1962, University of Maryland

Rita Klein Ives, *Professor of Special Education*
B.S. 1953, University of Pittsburgh; M.A. in Ed. 1957, Ed.S. 1967, Ed.D. 1971, George Washington University

David Iwamoto, *Professorial Lecturer in Education*
B.A. 1947, Walla Walla College; M.A. 1948, Columbia Union College; M.A. in Ed. 1952, Ed.D. 1963, George Washington University

Michael John Jackson, *Professor of Physiology*
B.S. 1953, University of London; Ph.D. 1966, Sheffield University

Robert Joseph Kassel Jacob, *Assistant Professorial Lecturer in Statistics*
B.A. 1972, M.S.E. 1974, Ph.D. 1976, Johns Hopkins University

Cecil Bryant Jacobson, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1960, University of Utah; M.D. 1964, George Washington University

Leslie Bravman Jacobson, *Assistant Professor of Speech*
B.S. 1970, Northwestern University; M.F.A. 1974, Boston University

N. Richard Janis, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1968, University of Wisconsin; J.D. 1972, Harvard University

Alvin Carl Jensen, *Professorial Lecturer in Education; Associate Dean of College of General Studies*
Ed.B. 1958, University of Wisconsin—Whitewater; M.A. in Ed. 1960, Ed.D. 1967, George Washington University

Diana Entwisle Johnson, *Assistant Professor of Biology*
B.A. 1970, Cornell College; Ph.D. 1975, University of Chicago

Kurt Edward Johnson, *Associate Professor of Anatomy*
B.S. 1965, Johns Hopkins University; M.Phil. 1969, Ph.D. 1970, Yale University

Nancy Diers Johnson, *Associate Professor of Human Kinetics and Leisure Studies*
B.S. 1955, University of Minnesota; M.A. 1966, University of Iowa; Ed.D. 1980, University of North Carolina, Greensboro

*On sabbatical leave academic year 1981-82.

Patricia Ann McHale Johnson, *Adjunct Instructor in English*
B.A. 1964, Immaculate Heart College; M.A. 1980, American University

Thomas Nick Johnson, *Professor of Anatomy*
B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

William Reid Johnson, *Associate Professor of History*
B.A. 1951, Oberlin College; M.A. 1955, Ph.D. 1961, University of Washington

Meredith Leam Jones, *Adjunct Professor of Biological Sciences*
B.A. 1948, M.A. 1952, Ph.D. 1956, University of California, Berkeley

Robert Gean Jones, *Professor of Religion; University Marshal*
B.A. 1947, Baylor University; B.D. 1950, M.A. 1957, Ph.D. 1959, Yale University

Jeffrey Harold Joseph, *Associate Professorial Lecturer in Business Administration*
B.A. 1966, George Washington University; J.D. 1973, University of Baltimore; M.A. 1974, University of Pennsylvania

Eva Scheyer Jospe, *Associate Professorial Lecturer in Religion*
M.A. 1963, Georgetown University

Hugo Dietrich Junghenn, *Professor of Mathematics*
B.S. 1964, Albright College; M.A. 1967, Villanova University; Ph.D. 1971, George Washington University

Robert Konrad Kahn, *Professorial Lecturer in Psychology*
B.A. 1946, University of Pennsylvania; M.A. 1953, George Washington University; Ph.D. 1957, Pennsylvania State University

Daniel R. Kane, *Assistant Professor of Business Administration*
B.S. 1953, George Washington University; B.S.F.S. 1954, J.D. 1956, LL.M. 1964, Georgetown University

William Michael Kane, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1969, Northwest Missouri State University; M.S. 1970, University of Utah; Ph.D. 1977, University of Oregon

Stephen Arnold Karp, *Associate Professor of Psychology*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1952, New School for Social Research; Ph.D. 1962, New York University

*Irving Katz, *Professor of Mathematics*
B.S. 1956, City University of New York, Brooklyn College; M.A. 1958, Ohio State University; Ph.D. 1964, University of Maryland

Marvin Stewart Katzman, *Lecturer in Business Administration*
B.B.S. 1955, University of Louisville; M.B.A. 1974, George Washington University

Nan Mattingly Kauer, *Lecturer in English*
B.A. 1972, Randolph-Macon College

Judith Gichner Kauffman, *Assistant Professorial Lecturer in Art*
B.F.A. 1968, Cornell University

Samuel Kavruck, *Professor of Education*
B.S. 1937, M.S. in Ed. 1939, City University of New York, City College; M.A. in Govt. 1950, Ed.D. 1954, George Washington University

†Warren Joseph Keegan, *Professor of Business Administration*
B.A. 1958, M.A. 1959, Kansas State University; M.B.A. 1961, D B.A. 1967, Harvard University

Richard Oliver Keelor, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1959, M.A. 1963, California State University, Long Beach; Ph.D. 1974, University of Southern California

Joanne K. Kelleher, *Assistant Professor of Physiology*
B.S. 1969, St. Louis University; M.A. 1972, Ph.D. 1976, Boston University

Steven Keller, *Assistant Professor of Speech; Director of Forensics*
B.S. 1968, M.A. 1969, Ohio State University

Eugene W. Kelly, Jr., *Professor of Education; Dean of the School of Education and Human Development*
B.A. 1958, M.Div. 1962, Josephinum College; M.Ed. 1969, Ph.D. 1971, University of South Carolina

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* On sabbatical leave academic year 1981-82.
† On leave of absence academic year 1981-82.

John Whitefield Kendrick, *Professor of Economics*
B.A. 1937, M.A. 1939, University of North Carolina; Ph.D. 1955, George Washington University

Robert Emmet Kennedy, Jr., *Associate Professor of European History*
B.A. 1963, Johns Hopkins University; M.A 1965, Boston College; Ph.D. 1973, Brandeis University

Richard Alec Kenney, *Professor of Physiology*
B.S. 1945, Ph.D. 1947, University of Birmingham

Robert Wayne Kenny, *Professor of History*
B.J. 1953, University of Texas; M.A. 1957, University of Minnesota; Ph.D. 1963, University of Chicago

Stephen Gabriel Kent, *Associate Professor of Pathology*
B.A. 1956, M.D. 1960, Case Western Reserve University

Hewitt Kenyon, *Professor of Mathematics*
B.S. 1942, Ph.D. 1954, University of California, Berkeley

Jackson Kelley Kern, *Assistant Professor of Statistics*
B.A. 1938, Fairmont State College; M.B.A. 1954, Columbia University

Margot Starr Kernan, *Associate Professor of Speech*
B.A. 1948, Bennington College; M.A. 1966, San Francisco State University

James Michael Kerns, *Assistant Professor of Anatomy*
B.A. 1966, St. Olaf College; M.S. 1968, Ph.D. 1972, Purdue University

Norayr Krikor Khatcheressian, *Associate Professor of Physics*
B.A. 1960, M.A. 1963, George Washington University; Ph.D. 1966, University of Virginia

Sura Kang Kim, *Studio Lecturer in Applied Music (Piano)*
B.A. 1949, Ewha University, Korea; Mus.B. 1950, Baldwin-Wallace College; Mus.M. 1952, Manhattan School of Music

Young Kim, *Professor of Political Science and International Affairs*
M.A. 1956, Vanderbilt University; Ph.D. 1958, University of Pennsylvania

Phyllis Dawn Kind, *Professor of Microbiology and of Medicine*
B.A. 1955, Montana State University; M.S. 1956, Ph.D. 1960, University of Michigan

Carleton W. King, Jr., *Studio Lecturer in Applied Music (Recorder)*
Mus.B. 1969, East Carolina University; Mus.M. 1976, University of Maryland

James Cecil King, *Professor of German*
B.A. 1949, M.A. 1950, Ph.D. 1954, George Washington University

Michael King, *Associate Professor of Chemistry*
B.S. 1966, Illinois Institute of Technology; M.A. 1967, Ph.D. 1970, Harvard University

Nancy Isner Kirkendall, *Associate Professorial Lecturer in Statistics*
B.S. 1965, M.S. 1967, Ohio State University; Ph.D. 1974, George Washington University

Margaret R. Kirkland, *Adjunct Instructor in English*
B.A. 1969, Mary Baldwin College; M.A. 1977, Georgetown University

Arthur David Kirsch, *Professor of Statistics and of Psychology*
B.A. 1955, George Washington University; M.S. 1956, Ph.D. 1957, Purdue University

*Peter Flindell Klarén, *Professor of History*
B.A. 1960, Dartmouth College; M.A. 1964, Ph.D. 1968, University of California, Los Angeles

Devra Gail Kleiman, *Adjunct Associate Professor of Psychology*
B.S. 1964, University of Chicago; Ph.D. 1969, University of London

David Klingman, *Associate Professor of Political Science*
B.A. 1966, University of Texas; M.A. 1967, University of Wisconsin; Ph.D. 1973, Michigan State University

Philip Klubes, *Professor of Pharmacology*
B.S. 1956, City University of New York, Queens College; M.S. 1959, Ph.D. 1962, University of Minnesota

Paul LeRoy Knight, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1973, M.A. 1975, George Washington University

Mark R. Knowles, *Assistant Professorial Lecturer in Health Services Administration*
B.S. 1962, Boston University; M.P.H. 1970, University of Pittsburgh

* On leave of absence fall semester 1981.

Robert Earle Knowlton, *Associate Professor of Biology; Assistant Dean of Columbian College of Arts and Sciences*
B.A. 1960, Bowdoin College; Ph.D. 1970, University of North Carolina

Maritta Koch-Weser, *Associate Professorial Lecturer in Anthropology*
Ph.D. 1975, Rheinische Friedrich Wilhelms Universitaet, Germany

Marilyn Jean Koering, *Professor of Anatomy*
B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Randall Enil Koran, *Lecturer in Health Services Administration*
B.A. 1973, Florida Technical University; M.S.P. 1976, Florida State University

Louis Sampson Kornicker, *Adjunct Professor of Biological Sciences*
B.S. 1941, B.S. 1942, University of Alabama; M.A. 1954, Ph.D. 1957, Columbia University

Anthony P. Kowalski, *Associate Research Professor of Education and Human Development; Director, Center for Research and Service, School of Education and Human Development*
B.A. 1957, St. Mary's College; M.A. 1966, Fordham University; Ph.D. 1977, New York University

Edith Kramer, *Adjunct Associate Professor of Art Therapy*

Joan Krash, *Adjunct Associate Professor of Art Therapy*
B.A. 1956, George Washington University; M.A. 1973, Ph.D. 1975, American University

Alcira I. G. Kreimer, *Associate Professorial Lecturer in Urban and Regional Planning*
M.A. 1966, University of Buenos Aires, Argentina; Ph.D. 1977, University of California, Berkeley

Kenneth Krell, *Adjunct Associate Professor of Genetics*
B.A. 1954, University of Pittsburgh; M.S. 1967, Ph.D. 1970, Columbia University

David A. Kriegman, *Lecturer in Mathematics*
B.S. 1970, M.S. 1972, Florida Institute of Technology

Alan M. Kriegsman, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1951, M.A. 1953, Columbia University

Dean Krueger, *Research Professor of Statistics and of Ophthalmology*
B.A. 1938, M.A. 1942, University of Chicago; M.S. 1959, Columbia University

Ruth Marilyn Krulfeld, *Professor of Anthropology*
B.A. 1956, Brandeis University; Ph.D. 1974, Yale University

Edwin Paul Kulawiec, *Professor of Education*
B.S. 1950, Bethany College, West Virginia; M.A. 1956, Seton Hall University; M.A.T. 1961, Indiana University; Ph.D. 1971, University of Wisconsin

Joseph H. Kullback, *Professorial Lecturer in Statistics*
B.A. 1955, George Washington University; M.S. 1957, Ph.D. 1961, Stanford University

Ajit Kumar, *Associate Professor of Biochemistry*
Ph.D. 1968, University of Chicago

Frederick Charles Kurtz, *Professor of Accounting*
B.S. in Com. 1948, University of Virginia; M.B.A. 1949, University of Pennsylvania; C.P.A. 1952, State of Maryland

William K. Kyle, *Professorial Lecturer in Business Administration*
B.S. 1962, M.B.A. 1968, Indiana University; Ph.D. 1972, University of California, Irvine

John Marion Lachin III, *Associate Research Professor of Statistics*
B.S. 1965, Tulane University of Louisiana; Sc.D. 1972, University of Pittsburgh

Melvin Paul Lader, *Assistant Professor of Art*
B.A. 1969, M.A. 1973, State University of New York at Albany

Jerry Lee Lake, *Associate Professor of Photography*
B.F.A. 1966, Virginia Commonwealth University; M.F.A. 1968, Ohio University

Alyson Lynette Lang, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1978, George Washington University

Carl James Lange, *Professor of Psychology; Vice President for Administration and Research*
B.S. 1945, Duke University; M.S. 1948, Ph.D. 1951, University of Pittsburgh

Larry D. Lankton, *Assistant Professorial Lecturer in American Civilization*
B.A. 1969, DePauw University; M.A. 1971, Ph.D. 1977, University of Pennsylvania

JoAnne Lanouette, *Adjunct Instructor in Anthropology*
B.S. 1967, University of Minnesota; M.A. 1976, George Washington University

Nicholas Lappas, *Associate Professor of Forensic Sciences*
B.A. 1964, Thiel College; M.S. 1973, Ph.D. 1975, Duquesne University

Geza Peter Lauter, *Professor of Business Administration*
B.A. 1954, Institute for Foreign Languages, Hungary; B.A. 1962, M.B.A. 1964, Ph.D. 1968, University of California, Los Angeles

Robert Alan Lavine, *Associate Professor of Physiology and of Neurology*
B.S. 1962, Ph.D. 1969, University of Chicago

Thelma Z. Lavine, *Elton Professor of Philosophy; Faculty Associate for Interdisciplinary Studies, Division of Experimental Programs*
B.A. 1936, Radcliffe College; M.A. 1937, Ph.D. 1939, Harvard University

William Medley Lawbaugh, *Professorial Lecturer in Journalism*
B.A. 1965, M.A. 1967, St. Louis University; Ph.D. 1972, University of Missouri

Page Raboteau Laws, *Assistant Professorial Lecturer in English*
B.A. 1973, Wellesley College; M.Phil. 1976, Ph.D. 1979, Yale University

Edward Pitt Lawson, *Assistant Professorial Lecturer in Art*
B.A. 1951, Bowdoin College; M.A. 1955, New York University

Margaret Ledford Lawson, *Assistant Professorial Lecturer in English*
B.A. 1961, University of Tennessee; M.A. 1968, Ph.D. 1972, University of North Carolina

William Matthew Leach, *Adjunct Professor of Genetics*
B.A. 1956, Berea College; M.S. 1962, Ph.D. 1965, University of Tennessee, Knoxville

Linda Jane Lear, *Adjunct Associate Professor of History; Assistant Director, Division of Experimental Programs*
B.A. 1962, Connecticut College; M.A. 1964, Columbia University; Ph.D. 1974, George Washington University

Hugh Linus LeBlanc, *Professor of Political Science and Public Affairs; Director, Programs in Public Affairs*
B.A. 1948, Louisiana State University and Agricultural and Mechanical College; M.A. 1950, University of Tennessee, Knoxville; Ph.D. 1958, University of Chicago

William Louis Lebovich, *Assistant Professorial Lecturer in Art*
B.A. 1970, Brandeis University; M.A. 1974, Boston University

Ann Lee, *Studio Lecturer in Applied Music (Voice)*
B.A. 1956, Seoul National University College of Music; Mus.M. 1959, New England Conservatory of Music

Davis Lin-chuan Lee, *Assistant Professor of Chinese*
B.S. 1955, Chung-Hsing University, Taiwan; M.S. 1959, University of Minnesota; Ph.D. 1979, Georgetown University

Myrna Pike Lee, *Associate Professor of Mathematics*
B.A. 1957, Cornell University; M.S. 1959, Ph.D. 1962, University of Illinois

W. David Lee, *Assistant Professorial Lecturer in Physics*
B.S. 1963, Clemson University; Ph.D. 1970, University of Virginia

Young-Ho Lee, *Lecturer in Business Administration*
B.A. 1969, M.B.A. 1971, Seoul National University

Donald Richard Lehman, *Associate Professor of Physics*
B.A. 1962, Rutgers—The State University; M.S. 1964, Air Force Institute of Technology; Ph.D. 1970, George Washington University

Patricia Hilary Madoo Lengermann, *Professor of Sociology*
B.A. 1963, Oxford University; M.A. 1966, Ph.D. 1969, Cornell University

Edwin Milton Lerner II, *Research Professor of Microbiology*
B.A. 1941, M.D. 1944, Harvard University

Sar Levitan, *Professor of Economics*
B.S.S. 1937, City University of New York, City College; M.A. 1939, Ph.D. 1949, Columbia University

Bernard Isaac Levy, *Professor of Psychology*
B.A. 1948, New York University; Ph.D. 1952, University of Rochester

Joseph Benjamin Levy, *Professor of Chemistry*
B.S. 1943, University of New Hampshire; M.S. 1945, Ph.D. 1948, Harvard University

Marvin Monroe Levy, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1971, City University of New York, Brooklyn College

Suzanne Carbonneau Levy, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1976, Bates College; M.A. 1978, American University

Edwin Joseph Baughman Lewis, *Professor of Accounting*
B.A. 1938, University of Western Ontario; M.B.A. 1939, Northwestern University

John Frederick Lewis, *Professor of Geology*
B.S. 1959, M.S. 1960, Victoria University of Wellington, New Zealand; D.Phil. 1964, Oxford University

Ralph Kepler Lewis, *Professor of Anthropology*
B.A. 1934, Southwest Missouri State College; M.A. 1939, University of Southern California; Ph.D. 1967, Columbia University

William H. Lewis, *Visiting Professor of International Affairs*
B.A. 1951, M.A. 1953, George Washington University; Ph.D. 1960, American University

Aaron Liberman, *Associate Professorial Lecturer in Health Services Administration*
B.A. 1965, Baylor University; M.S. 1966, Indiana University; M.A. 1968, Ph.D. 1974, University of Iowa

Samuel Robert Lichter, *Assistant Professor of Political Science*
B.A. 1969, University of Minnesota; Ph.D. 1977, Harvard University

Marilyn Louise Liebrenz, *Assistant Professor of Business Administration*
B.A. 1966, Wheaton College; M.A. 1973, Ph.D. 1980, Michigan State University

Hubert Whitman Lilliefors, *Professor of Statistics*
B.A. 1952, Ph.D. 1964, George Washington University; M.A. 1953, Michigan State University

Edward R. Lilly, *Assistant Professor of Education*
B.A. 1967, Morgan State University; M.S. 1971, City University of New York, City College; Ph.D. 1976, University of Connecticut

S. Donna Lind, *Assistant Professor of Health Services Administration*
B.S. 1971, Portland State University; Ph.D. 1978, Brandeis University

*Carl Arne Linden, *Associate Professor of International Affairs and Political Science*
B.A. 1951, Syracuse University; M.A. 1956, Harvard University; Ph.D. 1966, George Washington University

Roy Charles Lindholm, *Professor of Geology*
B.S. 1959, University of Michigan; M.A. 1963, University of Texas; Ph.D. 1967, Johns Hopkins University

Craig William Linebaugh, *Associate Professor of Speech and Associate Research Professor of Medicine*
B.A. 1970, Lebanon Valley College; M.A. 1974, Ph.D. 1975, Temple University

Donald Linkowski, *Professor of Education*
B.A. 1961, M.S. 1963, Ph.D. 1969, State University of New York at Buffalo

Calvin Darlington Linton, *Professor of English; Dean of Columbian College of Arts and Sciences*
B.A. 1935, George Washington University; M.A. 1939, Ph.D. 1940, Johns Hopkins University

Lewis Lipnick, *Studio Lecturer in Applied Music (Bassoon and Recorder)*
Mus.B. 1968, Peabody Institute of Baltimore

*Gordon Leslie Lippitt, *Professor of Behavioral Sciences*
B.S. 1942, Litt.D. 1971, Springfield College; B.D. 1946, Yale University; M.A. 1947, University of Nebraska; Ph.D. 1959, American University

Thomas Phillip George Liverman, *Professor of Mathematics and Adjunct Professor of Engineering and Applied Science*
B.A. 1941, University of Montpellier; M.A. 1948, Ph.D. 1956, University of Pennsylvania

John Lobuts, Jr., *Associate Professor of Management Science; Assistant Dean of the School of Government and Business Administration*
B.S. 1957, Fairmont State College; M.A. in Ed. 1965, Ed.D. 1970, George Washington University

Norma Maine Loeser, *Professor of Business Administration; Dean of the School of Government and Business Administration*
B.A. 1958, M.B.A. 1967, D.B.A. 1971, George Washington University

John Mortimer Logsdon, *Professor of Public Affairs and Political Science*
B.S. 1960, Xavier University, Ohio; Ph.D. 1970, New York University

* On sabbatical leave fall semester 1981.

John Frederick Long, *Assistant Professorial Lecturer in Geography*
B.S. 1967, Georgia Institute of Technology; M.A. 1970, Ph.D. 1974, University of North Carolina

William Francis Edward Long, *Professor of Economics; Dean of the Division of University and Summer Students*
B.A. 1946, M.A. 1947, Ph.D. 1967, George Washington University

Sebastian R. Lorigo, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1970, Philadelphia College of Textiles and Science; M.B.A. 1975, Widener College

Benjamin David Lourie, *Assistant Professorial Lecturer in Art*
B.A. 1971, Earlham College

Lela Porter Love, *Adjunct Instructor in Law; Assistant Director, Division of Experimental Programs*
B.A. 1973, Harvard University; M.Ed. 1975, Virginia Commonwealth University; J.D. 1979, Georgetown University

John Carl Lowe, *Professor of Geography and Regional Science*
B.A. 1958, M.A. 1960, George Washington University; Ph.D. 1969, Clark University

Gregory Ludlow, *Associate Professor of French; Assistant Dean of Columbian College of Arts and Sciences*
Licence ès Lettres 1962, University of Paris; Ph.D. 1970, McGill University, Canada

Robert Alfred Luke, Jr., *Assistant Professor of Education*
B.A. 1963, Colgate University; M.A. 1965, Ph.D. 1971, University of Maryland

Morton Lutzky, *Lecturer in Physics*
B.S. 1951, City University of New York, City College; M.S. 1959, University of Maryland

Ross Kevin Lynch, *Assistant Professor of Education*
B.A. 1973, M.S. 1975, St. Cloud State University; Ph.D. 1980, University of Wisconsin

Dorcas Joanne Lynn, *Assistant Professor of Health Care Sciences and of Medicine; Faculty Associate for Humanities and Medicine, Division of Experimental Programs*
B.S. 1970, Dickinson College; M.D. 1974, Boston University

James Lawrence Lyons, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1962, Wheeling College; J.D. 1967, Georgetown University

Ann Helen Macomber, *Research Instructor in Education*
B.A. 1974, Wheaton College; M.A. in Ed. 1977, George Washington University

James Hunt Maddox, *Associate Professor of English*
B.A. 1965, Princeton University; M.A. 1967, Ph.D. 1969, Yale University

Lynda M. Maddox, *Assistant Professor of Business Administration*
B.A. 1972, M.A. 1974, Pennsylvania State University; Ph.D. 1978, Southern Illinois University

Frances Sherwood Madoo, *Lecturer in English*
B.A. 1967, City University of New York, Brooklyn College; M.A. 1968, New York University; M.A. 1975, Johns Hopkins University

James Mahoney, Jr., *Associate Professorial Lecturer in Anthropology and American Civilization*
B.F.A. 1958, Philadelphia College of Art

Wendy Maiorana, *Adjunct Assistant Professor of Art Therapy*
B.A. 1961, American University; M.A. 1976, George Washington University

Stuart S. Malawer, *Professorial Lecturer in Business Administration*
J.D. 1967, Cornell University; M.A. 1968, Ph.D. 1976, University of Pennsylvania

Paul Bernard Malone III, *Assistant Professor of Business Administration; Assistant Dean of the School of Government and Administration for Undergraduate Programs*
B.S. 1952, U.S. Military Academy; M.S. in Per.Ad. 1969, D.B.A. 1973, George Washington University

William Everett Maloney, *Associate Professorial Lecturer in Geology*
B.S. 1950, M.S. 1951, George Washington University

Patricia Sarah Maloof, *Assistant Professorial Lecturer in Anthropology*
B.A. 1972, M.A. 1974, George Washington University; Ph.D. 1979, Catholic University of America

Harold George Mandel, *Professor of Pharmacology*
B.S. 1944, Ph.D. 1949, Yale University

Wallace Harper Mann, *Studio Lecturer in Applied Music (Flute)*
Mus.B. 1943, Eastman School of Music

Sigmund Herbert Manne, *Associate Professorial Lecturer in Forensic Sciences*
B.S.S. 1948, City University of New York, City College; M.S. 1950, University of Miami; Ph.D. 1962, New York University

Raymond Manning, *Adjunct Professor of Biological Sciences*
B.A. 1956, M.S. 1959, Ph.D. 1963, University of Miami

Nathan Mantel, *Research Professor of Statistics*
B.S. 1939, City University of New York, City College; M.A. 1956, American University

Edward Marasciulo, *Professorial Lecturer in Geography*
B.A. 1950, University of Miami

*Anthony Marinaccio, *Professor of Education*
Ed.B. 1937, Central Connecticut State College; M.A. 1939, Ohio State University; Ph.D. 1941, Yale University; LL.D. 1961, Parsons College

Winifred A.N. Mark, *Assistant Professorial Lecturer in English*
B.A. 1952, Trinity College, Dublin; M.A. 1952, Niagara University; Ph.D. 1978, Catholic University of America

Michael L. Marlow, *Assistant Professor of Economics*
B.A. 1975, George Washington University; Ph.D. 1978, Virginia Polytechnic Institute and State University

Elinor M. Maroney, *Lecturer in Art*
B.A. 1972, University of the District of Columbia

Howard Wight Marshall, *Associate Professorial Lecturer in American Civilization*
B.A. 1970, University of Missouri; M.A. 1972, Ph.D. 1976, Indiana University

Judith Perlman Martin, *Associate Professorial Lecturer in Journalism*
B.A. 1959, Wellesley College

Shelley Ellen Smith Mastran, *Assistant Professorial Lecturer in Geography and Regional Science*
B.A. 1965, Vassar College; M.A. 1974, George Washington University

Anthony James Mastro, *Professor of Accounting*
B.S. 1951, M.B.A. 1953, New York University; M.A. 1963, University of Notre Dame; C.P.A. 1955, State of New Jersey

Leonard C. Maximon, *Adjunct Professor of Physics*
B.A. 1947, Oberlin College; Ph.D. 1952, Cornell University

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1946, Medical College of Virginia of Virginia Commonwealth University; M.S. 1955, Trinity University; Ph.D. 1960, Vanderbilt University

Amy Jo Mazur, *Assistant Professor of Special Education*
B.A. 1971, M.A. 1974, Ed.D. 1977, George Washington University

Guido Ettore Mazzeo, *Professor of Romance Languages*
B.A. 1936, City University of New York, City College; M.A. 1938, Ph.D. 1961, Columbia University

†David McAleavey, *Assistant Professor of English*
B.A. 1968, M.F.A. 1972, Ph.D. 1975, Cornell University

John Francis McCarthy, Jr., *Associate Professor of Business Administration*
B.A. 1936, Duquesne University; M.L. 1955, University of Pittsburgh

Cynthia McClintock, *Assistant Professor of Political Science*
B.A. 1967, Harvard University; M.A. 1968, University of California, Los Angeles; Ph.D. 1976, Massachusetts Institute of Technology

Kenneth Frederick McClure, *Professorial Lecturer in Commercial Law*
B.S. 1931, M.S. 1932, Wichita State University; LL.B. 1941, University of Maryland

Lynn Elaine McDevitt, *Lecturer in Human Kinetics and Leisure Studies*

Roland D. McDevitt, *Visiting Assistant Professor of Political Science*
B.A. 1970, Kent State University; M.A. 1973, Northeastern University; Ph.D. 1978, University of California, Santa Barbara

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* On sabbatical leave fall semester 1981.
† On sabbatical leave academic year 1981-82.

James Kenneth McDonald, *Associate Professor of International Affairs*
B.A. 1954, Yale University; B.Litt. 1961, D.Phil. 1975, Oxford University

John Patrick McGill, *Associate Professorial Lecturer in Journalism*
B.S. 1967, Georgetown University

Dorn Charles McGrath, Jr., *Professor of Urban Planning*
B.A. 1952, Dartmouth College; M.C.P. 1959, Harvard University

Margaret McIntyre, *Professor of Education*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1944, Northwestern University; A.P.C. 1963, George Washington University

Cornelius Patrick McKelvey, *Assistant Professor of Health Services Administration*
B.S. 1963, Philadelphia College of Pharmacy and Science; M.S. 1970, University of Maryland; M.A. in H.C.A. 1973, George Washington University

Francis Edward McLaughlin, *Professorial Lecturer in Business Administration*
B.S. 1960, University of New Mexico; J.D. 1966, American University

Marian McNabb, *Studio Lecturer in Applied Music (Piano and Organ)*
Mus.B. 1930, University of Kansas; M.S. in Mus. 1949, Union Theological Seminary

Edward C. McReady, *Associate Professorial Lecturer in Accounting*
B.S., B.A. 1964, Georgetown University; J.D. 1972, American University

Cornelius Glen McWright, *Adjunct Professor of Forensic Sciences and of Biological Sciences*
B.A. 1952, University of Evansville; M.S. 1965, Ph.D. 1970, George Washington University

Richard A. Meese, *Assistant Professorial Lecturer in Economics*
B.S. 1974, University of Michigan; M.A. 1976, Ph.D. 1978, University of Wisconsin

Arthur Charles Meiners, Jr., *Associate Professorial Lecturer in Business Administration*
B.S. in B.A. 1956, Rockhurst College; M.B.A. 1964, University of Michigan; D.B.A. 1974, George Washington University

Lucy Lauretta Melbourne, *Lecturer in German*
B.A. 1970, George Washington University; M.A. 1972, Catholic University of America

John Latane Melnick, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1958, J.D. 1961, University of Virginia

Christine Foster Meloni, *Adjunct Instructor in English*
B.A. 1963, Wells College; M.A. 1964, Middlebury College; D.Lettere 1975, University of Rome

Kenneth Everett Melson, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1970, Denison University; J.D. 1973, George Washington University

Henry Merchant, *Associate Professor of Biology*
B.S. 1964, M.S. 1966, University of Maryland; Ph.D. 1970, Rutgers—The State University

*Bernard Matthew Mergen, *Professor of American Civilization*
B.A. 1959, University of Nevada; M.A. 1960, Ph.D. 1968, University of Pennsylvania

Astrid E. Merget, *Associate Professor of Public Administration*
B.A. 1967, Mount Holyoke College; M.P.A. 1968, Ph.D. 1973, Syracuse University

Carl Ronald Merril, *Adjunct Professor of Genetics and Professorial Lecturer in Biochemistry*
B.S. 1958, College of William and Mary; M.D. 1962, Georgetown University

Anthony Louis Mescher, *Assistant Professor of Biology*
B.S. 1971, St. Joseph's College, Indiana; M.S. 1973, Ph.D. 1975, Ohio State University

Michael Ray Metzger, *Assistant Professor of Economics*
B.S. 1972, M.A. 1973, University of Oklahoma; Ph.D. 1979, Stanford University

H. Emerson Meyers, *Professorial Lecturer in Music*

Jack William Millar, *Vivian Gill Professor of Epidemiology and Environmental Health*
B.A. 1945, Stanford University; M.D. 1947, George Washington University; M.P.H. 1951, M.S. in Hygiene and Tropical Medicine 1952, Harvard University

Frank Nelson Miller, Jr., *Professor of Pathology*
B.S. 1943, M.D. 1948, George Washington University

* On sabbatical leave academic year 1981-82.

James Miller, *Professor of Psychology*
B.A. 1958, J.D. 1962, Ph.D. 1966, Yale University

James C. Miller, *Professorial Lecturer in Economics*
B.B.A. 1964, University of Georgia; Ph.D. 1969, University of Virginia

Lenore Donna Miller, *Curator, Dimock Gallery*
B.A. 1969, Goucher College; M.F.A. 1972, George Washington University

Lillian Miller, *Professorial Lecturer in Art and American Civilization*
B.A. 1943, Radcliffe College; M.A. 1948, Ph.D. 1962, Columbia University

Mary Fetler Miller, *Assistant Professor of Russian*
B.A. 1943, Northwestern University; M.A. 1966, University of Michigan

*Samuel Burdick Molina, *Assistant Professor of Art*
B.A. 1964, M.A. 1969, University of Wyoming

Clarence Cowan Mondale, *Professor of American Civilization*
B.A. 1947, Macalester College; M.A. 1954, Ph.D. 1960, University of Minnesota

Marco Antonio Montemezzi, *Associate Professorial Lecturer in Mathematics*
B.S. 1949, California Institute of Technology; M.A. 1973, American University

Karen Montgomery, *Assistant Professorial Lecturer in Art*
B.S. 1957, University of Maryland; M.F.A. 1976, George Washington University

Terry William Moody, *Assistant Professor of Biochemistry*
B.S. 1972, California Institute of Technology; Ph.D. 1978, University of California, Berkeley

Dorothy Jones Moon, *Assistant Research Professor of Health Services Administration*
B.A. 1973, Marymount Manhattan College; M.S. 1975, City University of New York, Hunter College

Dorothy Adele Moore, *Professor of Education*
B.A. 1954, University of Maryland; M.A. 1959, A.P.C. 1964, Ed.D. 1970, American University

Michael John Moran, *Assistant Professorial Lecturer in Business Administration*
B.S. 1975, University of Bridgeport; Ph.D. 1980, Pennsylvania State University

Jonathan David Moreno, *Assistant Professor of Philosophy*
B.A. 1973, Hofstra University; Ph.D. 1977, Washington University

John Andrew Morgan, Jr., *Professor of Political Science and Public Affairs*
B.A. 1957, Stetson University; M.A. 1959, Ph.D. 1963, Duke University

John Morrell, Jr., *Assistant Professorial Lecturer in Art*
B.S. 1973, Georgetown University

Andrea Helen Morris, *Research Instructor in Human Kinetics and Leisure Studies*
B.S. 1974, M.A. 1978, University of Maryland

Malcolm Harold Morrison, *Associate Professorial Lecturer in Gerontology*
B.S. 1965, McGill University; M.A. 1967, Boston University; M.P.A. 1968, University of Michigan; Ph.D. 1974, Brandeis University

Margaret Morrison, *Assistant Professorial Lecturer in English*
B.A. 1969, M.A. 1972, Ph.D. 1977, George Washington University

Dixie Ann Michels Morse, *Lecturer in English*
B.A. 1970, Stanford University

James Norman Mosél, *Professor of Psychology*
B.A. 1940, Colgate University; M.A. 1941, Columbia University

Charles Arthur Moser, *Professor of Slavic*
B.A. 1956, Yale University; M.A. 1958, Ph.D. 1962, Columbia University

Yael M. Moses, *Assistant Professorial Lecturer in Hebrew*
B.S. 1965, Temple University; M.S. 1975, Towson State University

Ronald Raymond Mueller, *Associate Professorial Lecturer in Journalism*
B.S. 1969, U.S. Naval Academy

Robert Phillip Multhauf, *Adjunct Professor of History*
B.S. 1941, Iowa State University of Science and Technology; M.A. 1950, Ph.D. 1953, University of California, Berkeley

Joseph Patrick Murphy, *Professorial Lecturer in Business Administration*
B.A. 1949, LL.B. 1950, LL.M. 1952, George Washington University

* On sabbatical leave spring semester 1982.

Sharon Lee Murray, *Assistant Professor of Child Health and Development and Assistant Professorial Lecturer in Speech and Drama*
B.A. 1963, University of Oregon; M.A. 1969, University of Kentucky; Ph.D. 1972, University of Kansas

Carol Muske, *Jenny McKean Moore Visiting Lecturer in Creative Writing*
M.A. 1970, State University of California at San Francisco

David Myhra, *Associate Professorial Lecturer in Urban and Regional Planning*
B.S. 1962, Northern State College; M.S. 1965, North Dakota State University; M.A. 1972, Ph.D. 1977, Princeton University

Leonard Nadler, *Professor of Education*
B.B.A. 1948, M.S. 1950, City University of New York, City College; Ed.D. 1962, Columbia University

Honey Nashman, *Assistant Professor of Human Kinetics and Leisure Studies; Director of the Office of Laboratory Experience, School of Education and Human Development*
B.S. 1956, New York University; M.S. 1957, Smith College

Nadine Nadeshda Natov, *Professor of Russian*
M.A. 1939, Ph.D. 1941, Pedagogical Institute of Modern Languages, Soviet Union; Ph.D. 1969, University of Michigan

Henry Richard Nau, *Associate Professor of Political Science and International Affairs*
B.S. 1963, Massachusetts Institute of Technology; M.A. 1967, Ph.D. 1972, Johns Hopkins University

Anna Louise Kasten Nelson, *Adjunct Associate Professor of History*
B.A. 1954, M.A. 1956, University of Oklahoma; Ph.D. 1972, George Washington University

David Nelson, *Professor of Mathematics*
B.A. 1939, M.A. 1940, Ph.D. 1946, University of Wisconsin

*Benjamin Nimer, *Professor of Political Science and International Affairs*
B.A. 1942, Ph.D. 1953, University of Chicago

Robert Anthony Norris, *Studio Lecturer in Applied Music (Guitar)*

Mary Elizabeth Norton, *Associate Professorial Lecturer in Classics*
B.A. 1935, M.A. 1938, University of Michigan

Harriet Novakovich, *Assistant Professorial Lecturer in Special Education*
B.S. 1957, M.S. 1958, Southern Illinois University

Robert Edward O'Brien, *Assistant Professorial Lecturer in Mathematics*
B.A. 1967, M.A. 1968, University of Illinois; Ph.D. 1977, George Washington University

Stephen O'Brien, *Adjunct Professor of Genetics*
B.S. 1966, St. Francis College; Ph.D. 1971, Cornell University

Thomas O'Connor, *Professorial Lecturer in Management Science*
B.S. 1947, U.S. Naval Academy; M.B.A. 1956, Harvard University; Ph.D. 1965, Stanford University

Robert Stewart Odmark, *Studio Lecturer in Applied Music (French Horn)*
B.M. 1969, University of Michigan; M.M. 1972, Catholic University of America

Edward Kurt Offenbacher, *Assistant Professorial Lecturer in Economics*
B.A. 1973, Hebrew University of Jerusalem; M.A. 1976, Ph.D. 1979, University of Chicago

George Andrew Olkhovsky, *Associate Professor of Russian*
B.A. 1956, M.A. 1957, University of Minnesota; Ph.D. 1968, Georgetown University

Charles O'Rear, *Professor of Forensic Sciences*
B.S. 1957, Virginia Polytechnic Institute and State University; M.S. 1961, M.C. 1964, University of Richmond; Ph.D. 1970, Medical College of Virginia of Virginia Commonwealth University

Jan Marc Orenstein, *Assistant Professor of Pathology*
B.A. 1963, Johns Hopkins University; Ph.D. 1969, M.D. 1971, State University of New York Downstate Medical Center

†Türker Ozdogan, *Associate Professor of Ceramics*
Diploma 1967, School of Applied Fine Arts, Turkey; M.F.A. 1972, George Washington University

* On sabbatical leave spring semester 1982.
† On sabbatical leave fall semester 1981.

Harry P. Pachon, *Associate Professorial Lecturer in Public Administration*
B.A. 1967, M.A. 1968, California State University, Los Angeles; Ph.D. 1974, Claremont Graduate School

Randall Kent Packer, *Professor of Biology*
B.S. 1967, Lock Haven State College; Ph.D. 1971, Pennsylvania State University

Harry Robert Page, *Professor of Business Administration*
B.A. 1941, Michigan State University; M.B.A. 1950, Harvard University; Ph.D. 1966, American University

Chei-Min Paik, *Professor of Accounting and Quantitative Methods*
B.B.A. 1957, University of Minnesota; M.B.A. 1959, University of California, Los Angeles; D.B.A. 1963, Harvard University

Robert John Pallansch, *Studio Lecturer in Applied Music (Tuba)*

Phyllis Marynick Palmer, *Assistant Professor of Women's Studies and of American Civilization*
B.A. 1966, Oberlin College; M.A. 1967, Ph.D. 1973, Ohio State University

Salvatore Rocco Paratore, *Professor of Education; Associate Dean of the Division of University and Summer Students*
B.A. 1957, Colgate University; M.S. 1967, Yeshiva University; Ph.D. 1973, Syracuse University

David Charles Park, *Research Instructor in Human Kinetics and Leisure Studies*
B.A. 1963, University of Kentucky; M.S. 1967, University of North Carolina

Yoon Shik Park, *Associate Professor of Business Administration*
B.A. 1964, Kyung Hee University, Korea; M.B.A. 1967, Fairleigh Dickinson University; D.B.A. 1970, Harvard University; M.A. 1973, Ph.D. 1976, George Washington University

William Carleton Parke, *Associate Professor of Physics*
B.S. 1963, Ph.D. 1967, George Washington University

Ronald H. Parker, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1972, Kent State University; M.S. 1975, American University; Ed.D. 1979, University of Southern California

William Axel Parker, *Associate Professorial Lecturer in Health Services Administration*
B.S. 1945, University of Illinois; M.P.H. 1950, University of California, Berkeley; M.B.A. 1962, George Washington University

Richard Parnas, *Studio Lecturer in Applied Music (Violin and Viola)*

Robert Parris, *Professor of Music*
B.S. in Mus.Ed. 1945, M.S. in Mus.Ed. 1946, University of Pennsylvania; B.S. in Mus.Comp. 1948, Juilliard School of Music

*Gail Paster, *Assistant Professor of English*
B.A. 1966, Smith College; M.Phil. 1970, Ph.D. 1972, Yale University

Donald Clark Paup, *Professor of Human Kinetics and Leisure Studies*
B.A. 1961, Occidental College; M.S. 1969, Ph.D. 1970, Tulane University

David Leo Pawson, *Adjunct Associate Professor of Biological Sciences*
B.S. 1960, M.S. 1961, Ph.D. 1964, Victoria University, New Zealand

John N. Pearce, *Associate Professor of Urban Planning and American Civilization*
B.A. 1956, Yale University; M.A. 1959, University of Delaware

Edward S. Pearsall, *Associate Research Professor of Economics*
B.A. 1961, Amherst College; M.A. 1963, Ph.D. 1966, Princeton University

Eldor Olin Pederson, *Associate Professor of Geography and Regional Science*
B.A. 1966, University of Washington; C.Ph. 1969, Ph.D. 1974, University of California, Berkeley

Joseph Pelzman, *Associate Professor of Economics*
B.S. 1971, Ph.D. 1976, Boston College

Thomas Paul Perazzoli, *Studio Lecturer in Applied Music (Flute)*

Theodore Peter Perros, *Professor of Chemistry and of Forensic Sciences*
B.S. 1946, M.S. 1949, Ph.D. 1952, George Washington University

Laurence Colin Peters, *Lecturer in English*
B.A. 1974, University of Sussex; M.A. 1978, University of London

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* On sabbatical leave academic year 1981-82.

David Andreas Peterson, *Associate Professorial Lecturer in Business Administration*
B.A. 1964, Occidental College; J.D. 1967, M.B.A. 1968, George Washington University; M.P.A. 1974, Harvard University; Ph.D. 1975, Johns Hopkins University

Ruth Irene Peterson, *Associate Professor of Education*
B.S. 1945, State University of New York at Buffalo; M.S. 1946, Syracuse University; Ph.D. 1971, American University

John Charles Petricciani, *Adjunct Professor of Genetics and Professorial Lecturer in Biological Sciences*
B.S. 1958, Rensselaer Polytechnic Institute; M.S. 1960, University of Nevada, Reno; M.D. 1967, Stanford University

Vladimir Petrov, *Professor of International Affairs*
M.A. 1961, Ph.D. 1965, Yale University

J. Roger Peverley, *Assistant Professor of Physics*
B.A. 1960, M.A. 1964, Ph.D. 1964, Cambridge University

Paul S. Peyser, *Visiting Assistant Professor of Business Administration*
B.A. 1966, State University of New York at Binghamton; M.A. 1970, Ph.D. 1979, University of Wisconsin

Marianne Ruth Phelps, *Assistant Professorial Lecturer in Education; Assistant Provost for Affirmative Action*
B.A. 1961, University of Michigan; M.S. 1964, M.A. 1965, University of Wisconsin; M.Phil 1973, Ph.D. 1980, George Washington University

Ewing Lakin Phillips, *Professor of Psychology; Director, Counseling Center*
B.S. 1937, Central Missouri State College; M.A. 1940, University of Missouri; Ph.D. 1949, University of Minnesota

Richard L. Phipps, *Assistant Professorial Lecturer in Biological Sciences*
B.S. 1958, Eastern Illinois University; M.S. 1960, Ph.D. 1965, Ohio State University

Dante James Picciano, *Associate Professorial Lecturer in Biological Sciences and Adjunct Associate Professor of Genetics*
B.S. 1966, M.S. 1969, Ph.D. 1973, George Washington University

Catherine Jones Pickar, *Adjunct Assistant Professor of Music*
B.Mus. 1974, University of Kentucky; M.Mus. 1980, George Washington University

Jack Warren Pierce, *Adjunct Professor of Geology*
B.S. 1949, M.S. 1950, University of Illinois; Ph.D. 1964, University of Kansas

Alfredo Guido Pieruccini, *Associate Professorial Lecturer in Business Administration*
B.G.E. 1958, University of Omaha; M.B.A. 1963, Lehigh University; D.B.A. 1974, George Washington University

Renate Roitner Plaut, *Associate Research Professor of Statistics*
M.D. 1954, University of Chile; M.S. 1979, George Washington University

Judith Ann Abrams Plotz, *Associate Professor of English*
B.A. 1960, Radcliffe College; B.A. 1962, M.A. 1966, Cambridge University; Ph.D. 1965, Harvard University

Herman Pollack, *Research Professor of International Affairs*
B.S. 1940, City University of New York, City College; M.A.I.A. 1966, George Washington University

David Pollock, *Visiting Assistant Professor of Political Science*
B.A. 1972, Ph.D. 1978, Harvard University

Paul John Poppen, *Associate Professor of Psychology*
B.A. 1969, Central University of Iowa; Ph.D. 1973, Cornell University

Ben Posner, *Professorial Lecturer in Public Administration*
B.S. in B.A. 1936, University of Arizona; M.A. in Govt. 1941, George Washington University; Ph.D. 1962, American University

Francisco Prats, *Professor of Physics*
Licenciado en Ciencias Fisico 1946, University of Madrid; Ph.D. 1958, University of Maryland

Elizabeth Carnes Price, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1972, Randolph-Macon Woman's College; M.A. 1979, New York University

Stephen Henry Prussing, *Studio Lecturer in Applied Music (Voice)*
B.A. 1945, Occidental College; Postgraduate Diploma 1948, Juilliard School of Music

William A. Pucilowsky, *Assistant Professor of Speech and Drama*
B.S. 1964, Wilkes College; M.F.A. 1972, Boston University

Charles William Puffenbarger, *Professorial Lecturer in Journalism*
B.S. 1951, University of Maryland; M.A. 1964, George Washington University

Eva Maria Pulgram, *Assistant Professorial Lecturer in German*
M.A. 1969, Ph.D. 1976, Vanderbilt University

Ralph Elliott Purcell, *Professor of Political Science*
B.A. 1940, Florida Southern College; M.A. 1941, Duke University; Ph.D. 1949, University of Wisconsin

Jon Alrik Quitslund, *Associate Professor of English*
B.A. 1961, Reed College; Ph.D. 1967, Princeton University

Sonya Antoinette Quitslund, *Assistant Professor of Religion*
B.A. 1958, Seattle University; M.A. 1964, Ph.D. 1967, Catholic University of America

Constance Adelaide Rachlin, *Studio Lecturer in Applied Music (Piano)*
Artist Diploma 1938, Curtis Institute of Music; Artist Diploma and Teacher's Certificate 19[illegible] American Conservatory at Fontainbleau

David Ramaker, *Associate Professor of Chemistry*
B.S. 1965, University of Wisconsin—Milwaukee; M.S. 1968, Ph.D. 1971, University of Iowa

Margaret Mary Hupp Ramsay, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1957, Purdue University; M.S. 1958, University of Wisconsin

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College; LL.B. 1949, M.A. 1957, Columbia University; Ph.D. 1966, American University

Martha Norman Rashid, *Professor of Education*
Ed.B. 1949, State University of New York College at Geneseo; M.A. 1951, Ph.D. 1955, University of Iowa

Robert W. Read, *Professorial Lecturer in Biological Sciences*
B.S. 1958, University of Miami; M.S. 1961, Cornell University; Ph.D. 1968, University of the West Indies, Jamaica

John Palmer Reesing, Jr., *Professor of English*
B.A. 1941, Baylor University; M.A. 1942, Tulane University; Ph.D. 1954, Harvard University

Philip Norman Reeves, *Professor of Health Services Administration*
M.B.A. 1959, University of Chicago; D.B.A. 1970, George Washington University

Martin A. Regalia, *Assistant Professorial Lecturer in Business Administration*
B.A. 1972, University of Santa Clara; M.S. 1976, Ph.D. 1978, University of Wisconsin

Joan Roddy Regnell, *Associate Professor of Speech*
B.A. 1954, M.A. 1960, George Washington University

Harald Alfred Rehder, *Adjunct Professor of Biological Sciences*
B.A. 1929, Bowdoin College; M.A. 1933, Harvard University; Ph.D. 1934, George Washington University

Bernard Reich, *Professor of Political Science and International Affairs*
B.A. 1961, City University of New York, City College; M.A. 1963, Ph.D. 1964, University of Virginia

Melvin Reich, *Professor of Microbiology*
B.S. 1953, City University of New York, City College; M.S. 1957, Ph.D. 1960, Rutgers—The State University

Frances Catherine Reid, *Adjunct Assistant Professor of English*
B.A. 1965, College of Notre Dame of Maryland; M.S. 1970, Georgetown University

Mildred Myers Reynolds, *Associate Professorial Lecturer in Health Services Administration*
B.S. 1952, Indiana Central University; M.S. 1955, Butler University; M.S.W. 1969, Catholic University of America; Ed.D. 1978, George Washington University

William Martin Reynolds, *Professor of Speech*
B.A. 1950, Wichita State University; M.A. 1957, Ph.D. 1960, University of Florida

Leo Paul Ribuffo, *Associate Professor of History*
B.A. 1966, Rutgers—The State University; M.Phil. 1969, Ph.D. 1976, Yale University

Charles Edward Rice, *Professor of Psychology; Assistant Dean of the Graduate School of Arts and Sciences*
B.S. 1954, Iowa State University of Science and Technology; Ph.D. 1959, Case Western Reserve University

Mary Rice, *Adjunct Associate Professor of Biological Sciences*
B.A. 1947, Drew University; M.A. 1949, Oberlin College; Ph.D. 1966, University of Washington

Curtis William Richards, *Associate Professorial Lecturer in Business Administration*
B.S. 1960, M.S. 1961, Ph.D. 1977, University of Wisconsin

Gerald Murray Richman, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1963, Western Maryland College; J.D. 1966, University of Maryland

Robert Isaac Richter, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1969, University of Vermont; J.D. 1972, University of Chicago

Thomas Joseph Riegert, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1956, University of Cincinnati; M.A. 1977, American University

Anne Curtin Riley, *Adjunct Instructor in Accounting*
B.A. 1973, Nazareth College of Rochester; M.S. 1975, Syracuse University

James Willis Robb, *Professor of Romance Languages*
B.A. 1939, Colgate University; M.A. 1950, Middlebury College; Ph.D. 1958, Catholic University of America

*Philip Robbins, *Associate Professor of Journalism*
B.A. 1952, Washington and Lee University; M.S. 1955, Columbia University

Lilien Filipovitch Robinson, *Professor of Art*
B.A. 1962, M.A. 1965, George Washington University; Ph.D. 1978, Johns Hopkins University

Thomas Robert Robinson, *Associate Professorial Lecturer in Economics*
B.A. 1965, M.Phil. 1970, Ph.D. 1974, George Washington University

Elie Rogers, *Associate Professorial Lecturer in Journalism*
B.A. 1955, University of Colorado

Daniel David Roman, *Professor of Management Science*
B.S. in B.A. 1949, M.A. 1953, Ph.D. 1956, University of Southern California

Ann Romines, *Assistant Professor of English*
B.A. 1964, Central Methodist College; M.A. 1968, Tufts University; Ph.D. 1977, George Washington University

Frank J. Rooney, *Assistant Professor of Accounting*
B.A. 1970, Loyola College; B.A. 1971, George Mason University; J.D. 1974, George Washington University; LL.M. 1978, Georgetown University

Clyde Forrest Roper, *Adjunct Associate Professor of Biological Sciences*
B.S. 1959, Transylvania University; M.S. 1962, Ph.D. 1967, University of Miami

David Ralph Rorick, *Studio Lecturer in Applied Music (Trumpet)*
B.F.A. 1973, M.F.A. 1976, Carnegie-Mellon University; D.M.A. 1979, Catholic University of America

Colin Campbell Rorrie, Jr., *Professorial Lecturer in Health Services Administration*
B.A. 1964, Beloit College; M.A. 1966, Ph.D. 1968, University of Iowa

Carolyn Rusch Rose, *Adjunct Assistant Professor of Art and Anthropology*
B.A. 1971, Sweet Briar College; M.A. 1976, George Washington University

Zell Berman Rosenfelt, *Lecturer in English*
B.A. 1969, Cornell University; M.A. 1970, University of Chicago

Joseph Rosewater, *Adjunct Associate Professor of Biological Sciences*
B.S. 1950, M.S. 1956, University of New Hampshire; Ph.D. 1960, Harvard University

Edward Daniel Ross, Jr., *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1967, College of St. Thomas; J.D. 1970, Georgetown University

Patricia Ann Rossiter-Ravenscroft, *Adjunct Assistant Professor of Art Therapy*
B.A. 1972, Duke University; M.A. 1974, George Washington University

Lawrence Allen Rothblat, *Professor of Psychology*
B.A. 1964, M.A. 1967, Ph.D. 1968, University of Connecticut

Walter Frederick Rowe, *Associate Professor of Forensic Sciences*
B.S. 1967, Emory University; M.A. 1968, Ph.D. 1975, Harvard University

William Woodin Rowe, *Associate Professor of Russian*
B.A. 1956, Harvard University; Ph.D. 1968, New York University

*On sabbatical leave spring semester 1982.

David Alton Rowley, *Professor of Chemistry; Assistant Dean of th Graduate School of Arts and Sciences*
B.S. 1963, M.S. 1964, State University of New York at Albany; Ph.D. 1968, University o Illinois

William Rutiser, *Associate Professorial Lecturer in Statistics*
B.S. 1967, George Washington University

Robert Clinton Rutledge, *Associate Professor of English; Assistant Dean o Columbian College of Arts and Sciences*
B.A. 1940, University of Virginia; M.A. 1957, Ph.D. 1966, George Washington University

Roger Duane Rutz, *Assistant Professorial Lecturer in Business Administra tion*
B.S. 1974, M.A. 1976, Ph.D. 1979, University of Nebraska

Raymond Theodore Rye II, *Lecturer in Geology*
B.S. 1955, Iowa State University; M.S. 1971, George Washington University

Bradley William Sabelli, *Assistant Professor of Speech and Drama*
B.F.A. 1970, Florida Atlantic University; M.A. 1972, California State University, Humboldt M.F.A. 1974, George Washington University

Howard Morley Sachar, *Professor of History*
B.A. 1947, Swarthmore College; M.A. 1950, Ph.D. 1953, Harvard University

*James Minor Sachlis, *Associate Professor of Business Administration*
B.S. 1964, M.B.A. 1966, D.B.A. 1975, University of Maryland

Pilar G. Suelto de Sáenz, *Associate Professor of Spanish*
Licenciada 1953, University of Madrid; M.A. 1957, Bryn Mawr College; Ph.D. 1966, University of Maryland

George Max Saiger, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1963, Harvard University; M.D. 1967, Albert Einstein College of Medicine

Michael Edwin Samuels, *Assistant Professorial Lecturer in Health Services Administration*
B.A. 1964, Guilford College; M.A. 1972, George Washington University; Dr.P.H. 1975, University of North Carolina

John F. Santino, *Assistant Professorial Lecturer in American Civilization and in Anthropology*
B.A. 1970, Boston College; M.A. 1973, University of Pennsylvania

Burton Malcolm Sapin, *Professor of International Affairs and Political Science; Dean of the School of Public and International Affairs*
B.A. 1945, M.A. 1947, Columbia University; Ph.D. 1953, Princeton University

Judy D'Amico Schafer, *Assistant Professorial Lecturer in Speech and Drama*
B.A. 1972, M.S. 1973, Loyola College

Moses S. Schanfield, *Adjunct Associate Professor of Genetics*
B.A. 1966, University of Minnesota; M.A. 1969, Harvard University; Ph.D. 1971, University of Michigan

Richard M. Scheffler, *Associate Professor of Economics*
B.S. 1965, University of Vermont and Hofstra University; M.A. 1967, City University of New York, Brooklyn College; Ph.D. 1971, New York University

Stefan Otto Schiff, *Professor of Zoology*
B.S. 1952, Roanoke College; Ph.D. 1964, University of Tennessee, Knoxville

Richard Harold Schlagel, *Professor of Philosophy*
B.S. 1949, Springfield College; M.A. 1952, Ph.D. 1955, Boston University

Jeffrey Schlom, *Adjunct Professor of Genetics*
B.S. 1963, Ohio State University; M.S. 1966, Adelphi University; Ph.D. 1969, Rutgers—The State University

Marilyn Strauss Schmal, *Clinical Instructor in Art Therapy*
B.A. 1969, M.A. 1974, George Washington University

Frank Schmidt, *Research Professor of Psychology*
B.A. 1966, Bellarmine College; M.S. 1968, Ph.D. 1970, Purdue University

William Edward Schmidt, *Professor of Chemistry*
B.S. 1943, M.S. 1950, George Washington University; M.A., Ph.D. 1953, Princeton University

* On sabbatical leave spring semester 1982.

Henry Frederick Schuelke III, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1964, Saint Peter's College; J.D. 1967, Villanova University

Robert B. Schulman, *Assistant Professorial Lecturer in Forensic Sciences*
J.D. 1973, University of Baltimore

Robert Lee Schweitzer, *Associate Professorial Lecturer in Business Administration*
B.S. 1971, Towson State University; M.A. 1973, University of Delaware; Ph.D. 1975, Duke University

Lois Green Schwoerer, *Professor of History*
B.A. 1949, Smith College; M.A. 1952, Ph.D. 1956, Bryn Mawr College

Ormond Albert Seavey, *Assistant Professor of English*
B.A. 1966, Carleton College; M.A. 1967, Ph.D. 1976, Columbia University

Steven A. Seelig, *Associate Professorial Lecturer in Business Administration*
B.A. 1966, Ph.D. 1971, Clark University; M.A. 1968, Washington University

Frank William Segel, *Professorial Lecturer in Accounting*
B.S. 1959, Johns Hopkins University; M.B.A. 1964, M.Phil. 1971, Ph.D. 1972, George Washington University

Barbara Rae Seidman, *Studio Lecturer in Applied Music (Harp)*
Mus.B. 1969, Cleveland Institute of Music; Mus.M. 1970, Northwestern University

Richard Paul Seifert, *Associate Professor of Biology*
B.A. 1968, Grinnell College; Ph.D. 1974, State University of New York at Stony Brook

Ruth O. Selig, *Assistant Professorial Lecturer in Anthropology*
B.A. 1964, Wellesley College; M.A.T. 1966, Harvard University; M.A. 1975, George Washington University

Anastasia Seremetis, *Assistant Professorial Lecturer in Art*
B.A. 1973, M.F.A. 1975, George Washington University

Elwood Lewis Shafer, Jr., *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1956, M.F. 1957, Pennsylvania State University; Ph.D. 1966, State University of New York, College of Environmental Science and Forestry

Stanley Shaloff, *Professorial Lecturer in History*
B.A. 1960, City University of New York, City College; M.A. 1962, Ph.D. 1967, Northwestern University

Muhammed Tariq Shams, *Assistant Professorial Lecturer in Physics*
B.S. 1972, Ph.D. 1978, George Washington University

Horace F. Shamwell, Jr., *Assistant Professorial Lecturer in Business Administration*
B.A. 1964, Oberlin College; J.D. 1967, Columbia University

Jenny Schulter Shapiro, *Lecturer in English*
B.A. 1968, George Washington University

Michael S. Shapiro, *Assistant Professor of Museum Studies and of American Civilization*
B.A. 1970, Syracuse University; M.A. 1974, Ph.D. 1980, Brown University

Robert Poindexter Sharkey, *Professor of Economic History*
B.A. 1948, Princeton University; Ph.D. 1958, Johns Hopkins University

Zalman Arthur Shavell, *Professorial Lecturer in Management Science*
B.Aero.Eng. 1960, Rensselaer Polytechnic Institute; M.B.A., 1962, Ph.D. 1969, University of Maryland

Debra R. Sheldon, *Assistant Professor of Accounting*
B.A. 1969, Northwestern University; M.B.A. 1974, Drexel University

Charles C. Shepherd, Jr., *Assistant Professorial Lecturer in Business Administration*
B.S. 1971, University of Texas; J.D. 1973, American University

Stanley Newton Sherman, *Associate Professor of Business Administration*
B.A. 1952, M.B.A. 1960, D.B.A. 1977, University of Maryland

Chung-wen Shih, *Professor of Chinese*
B.A. 1945, St. John's University, China; M.A. 1949, Ph.D. 1955, Duke University

Jay Robert Shotel, *Professor of Special Education*
B.A. 1967, Ed.M. 1970, Ed.D. 1972, Temple University

*Robert George Shouldice, *Associate Professor of Health Services Administration*
B.A. 1966, Lycoming College; M.B.A. 1969, D.B.A. 1974, George Washington University

Walter Allen Shropshire, Jr., *Professorial Lecturer in Botany*
B.S. 1954, M.S. 1956, Ph.D. 1958, George Washington University

Martin Sicker, *Professorial Lecturer in Gerontology*
B.A. 1965, Long Island University, C.W. Post College; M.A. 1967, Ph.D. 1972, New School for Social Research

Herschel Sidransky, *Professor of Pathology*
B.S. 1948, M.D. 1953, M.S. 1958, Tulane University

Frederic Richard Siegel, *Professor of Geochemistry*
B.A. 1954, Harvard University; M.S. 1958, Ph.D. 1961, University of Kansas

Gaston Sigur, *Professor of International Affairs; Director, Institute for Sino-Soviet Studies*
Ph.D. 1957, University of Michigan

David Elliot Silber, *Professor of Psychology*
B.A. 1958, Wayne State University; M.A. 1960, Ohio University; Ph.D. 1965, University of Michigan

Stanley C. Silverberg, *Professorial Lecturer in Business Administration*
B.A. 1952, University of Wisconsin; M.A. 1953, Ph.D. 1959, Yale University

Suzanne Lee Simons, *Associate Professor of Anthropology*
B.A. 1948, Ohio State University; M.A. 1964, Ph.D. 1969, University of New Mexico

Thomas D. Simpson, *Professorial Lecturer in Economics*
B.A. 1964, University of Minnesota; Ph.D. 1968, University of Chicago

Amar Jit Singh, *Associate Professorial Lecturer in Health Services Administration*
M.S. 1967, University of Birmingham; M.S. 1969, Ph.D. 1972, Case Western Reserve University

Nozer Darabsha Singpurwalla, *Professor of Operations Research and Research Professor of Statistics*
B.S. 1959, B.V. Bhoomraddi College of Engineering and Technology, India; M.S.(I.E.) 1964, Rutgers—The State University; Ph.D. 1968, New York University

Myrna Carol Sislen, *Studio Lecturer in Applied Music (Guitar)*
B.A. 1970, American University

Frank James Slaby, *Associate Professor of Anatomy*
B.S. 1965, California Institute of Technology; Ph.D. 1971, University of California, Berkeley

Michelle Lynn Slagle, *Visiting Instructor in Business Administration*
B.B.A. 1970, M.B.A. 1973, George Washington University

Claudia Smigrod, *Assistant Professorial Lecturer in Art*
B.F.A. 1971, Alfred University

Arthur Hall Smith, *Associate Professor of Painting*
B.F.A. 1951, Illinois Wesleyan University; M.F.A. 1979, George Washington University

Benjamin Williams Smith, *Professor of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

Charles C. Smith, *Assistant Professorial Lecturer in Geology*
B.S. 1963, University of Texas at Austin; M.S. 1967, University of Houston; Ph.D. 1975, University of Texas at Dallas

Daniel L. Smith, *Associate Professorial Lecturer in Journalism*
B.F.A. 1973, Virginia Commonwealth University

George Wilson Smith, *Associate Professor of Education*
B.A. 1953, Central State College; Ed.M. 1965, Ed.D. 1971, University of Maryland

Joseph Thurston Smith, *Associate Professorial Lecturer in Forensic Sciences*
M.D. 1952, University of Alberta

Linda T. Smith, *Assistant Professorial Lecturer in Art*
B.F.A. 1975, Florida International University

Paul Albert Smith, *Professorial Lecturer in International Affairs*
B.S.F.S. 1949, Georgetown University; M.P.A. 1957, Harvard University

* On sabbatical leave fall semester 1981.

Steven S. Smith, *Assistant Professor of Political Science*
B.A. 1975, St. Cloud State University; Ph.D. 1980, University of Minnesota

*Walton Edward Smith, *Associate Professor of Management Science*
B.S. 1960, M.S. 1962, University of Missouri; D.Sc. 1972, George Washington University

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London

Olav Christen Snellingen, *Professorial Lecturer in Economics*
LL.M. 1957, Oslo University, Norway

Jane Roberta Snider, *Visiting Assistant Professor of Special Education*
B.A. in Ed. 1968, M.A. in Ed. 1971, Ed.D. 1978, George Washington University

Jeanne Ellen Snodgrass, *Professor of Human Kinetics and Leisure Studies*
B.A. 1952, Ohio Wesleyan University; M.S. in P.E. 1953, Smith College; Ed.D. 1975, University of North Carolina at Greensboro

Nancy Joan Shore Sobel, *Associate Professor of Special Education*
B.S. 1966, University of Michigan; M.A. in Ed. 1970, George Washington University; Ed.D. 1978, American University

Michael Joseph Sodaro, *Assistant Professor of International Affairs and Political Science*
B.A. 1967, Fordham University; M.A. 1970, Johns Hopkins University; Ph.D. 1978, Columbia University

Israel Gregory Sohn, *Adjunct Professor of Geology*
B.S. 1935, City University of New York, City College; M.A. 1938, Columbia University; Ph.D. 1965, Hebrew University, Israel

Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1950, Ph.D. 1959, New York University

Thomas Songster, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, Doane College; M.A. 1963, Northeast Missouri State University; Ph.D. 1967, University of Utah

Alvin Richard Souder, *Lecturer in English*
B.A. 1975, University of Pittsburgh; M.A. 1976, University of Reading

Richard M. Fairfax Southby, *Associate Professor of Health Services Administration*
B.Com. 1965, University of Melbourne; M.P.A. 1967, Cornell University; Ph.D. 1973, Monash University, Australia

Jayne Baker Spain, *Distinguished Visiting Professor of Government and Business Administration*
B.S. 1947, University of California, Berkeley; LL.D. 1969, Edgecliff College; Dr.Pub.Serv. 1970, George Washington University; LL.D. 1970, University of Cincinnati; LL.D. 1972, Dunbarton College of the Holy Cross; D.H.L. 1972, Bryant College of Business Administration; LL.D. 1973, Springfield College; LL.D. 1973, Gallaudet College; D.H.L. 1973, Russell Sage College; D.H.L. 1975, Loyola College; D.H.L. 1978, Westminster College (Pennsylvania)

Carol M. Sparhawk, *Adjunct Assistant Professor of English*
B.A. 1966, Oberlin College; M.A. 1967, Ph.D. 1976, University of Michigan

Sheila A. Spector, *Assistant Professorial Lecturer in English*
B.A. 1968, Towson State University; M.A. 1970, Ph.D. 1976, University of Maryland

Paul Eppley Spiegler, *Associate Professorial Lecturer in Biological Sciences*
B.S. 1956, University of Maryland; M.A. 1959, George Washington University

Suzanne Maria Spolarich, *Adjunct Instructor in English*
B.A. 1971, Mount Saint Agnes College; M.A. 1975, Columbia University

Marina Stajic, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1972, University of Novi Sad, Yugoslavia; Ph.D. 1977, University of Maryland

Loretta May Stallings, *Professor of Human Kinetics and Leisure Studies*
B.A. 1947, Stanford University; M.A. 1950, University of the Pacific; Ed.D. 1965, University of Texas

George Stambuk, *Professor of International Affairs*
Abs.Jur. 1943, University of Zagreb, Yugoslavia; M.A. 1956, Ph.D. 1961, Indiana University

*On sabbatical leave academic year 1981-82.

Carol Buchalter Stapp, *Research Instructor in Education*
B.A. 1967, Tulane University; M.A. 1969, University of Pennsylvania

James Edward Starrs, *Professor of Law and Forensic Sciences*
B.A., LL.B., 1958, St. John's University, New York; LL.M. 1959, New York University

Donald Eugene Starsinic, *Assistant Professorial Lecturer in Geography and Regional Science*
B.A. 1952, University of Pittsburgh; M.A. 1957, University of Chicago

Carl Steiner, *Professor of German*
B.A. 1958, M.A. 1962, Ph.D. 1966, George Washington University

George Steiner, *Professor of Music; Director of Orchestra*
B.S. 1938, Mus.B. 1938, Mus.M. 1940, Johns Hopkins University

Christopher Willie Sten, *Associate Professor of English*
B.A. 1966, Carleton College; M.A. 1968, Ph.D. 1971, Indiana University

Jeffrey L. Stephanic, *Visiting Assistant Professor of Art*
B.A. 1977, M.F.A. 1980, George Washington University

George Christopher Stephens, *Assistant Professor of Geology*
B.S. 1967, M.S. 1969, George Washington University; Ph.D. 1972, Lehigh University

Richard Walton Stephens, *Professor of Sociology*
B.A. 1951, Franklin and Marshall College; M.A. 1953, Ph.D. 1956, University of North Carolina

Charles Todd Stewart, Jr., *Professor of Economics*
B.A. 1946, M.A. 1948, Ph.D. 1954, George Washington University

Edward C. Stewart, *Associate Professorial Lecturer in Psychology*
B.A. 1950, University of Maryland; Ph.D. 1957, University of Texas

Phyllis Langton Stewart, *Professor of Sociology*
B.A. 1961, M.A. 1962, California State University, Los Angeles; Ph.D. 1968, University of California, Los Angeles

Gerald Virgil Stokes, *Associate Professor of Microbiology*
B.A. 1967, Southern Illinois University; Ph.D. 1973, University of Chicago

Eugene Almon Stone, *Associate Professor of Mathematics*
B.A. 1960, Vanderbilt University; Ph.D. 1966, University of Virginia

James Ashley Straw, *Professor of Pharmacology*
B.S. 1958, Ph.D. 1963, University of Florida

Margaret Ann Strom, *Instructor in English*
B.A. 1967, American University; M.A. 1970, University of Maryland; M.F.A. 1979, George Washington University

Paul Vincent Sullivan, *Lecturer in English*
B.A. 1970, M.L.S. 1971, University of Texas; M.A. 1978, Middlebury College

Theodore Suranyi-Unger, Jr., *Research Professor of Economics*
B.A. 1950, Syracuse University; Dr. rer. pol. 1957, University of Vienna

Esther C. Suss, *Assistant Professorial Lecturer in Economics*
B.S. 1969, M.A. 1971, Ph.D. 1972, University of Pittsburgh

Paravastu Swamy, *Adjunct Professor of Economics*
M.A. 1957, M.S. 1958, Andhra University, India; Ph.D. 1968, University of Wisconsin

Choy-Tak Taam, *Professor of Mathematics*
B.S. 1942, University of Illinois; M.A. 1943, Ph.D. 1945, Harvard University

John Alan Talbot, *Adjunct Instructor in Accounting*
B.A. 1972, Gettysburg College; M.A. 1974, University of Maryland

Roland Henry Tanck, *Associate Research Professor of Psychology*
B.A. 1939, University of Wisconsin; M.A. 1948, Ph.D. 1956, George Washington University

Vito Tanzi, *Adjunct Professor of Economics*
B.A. 1951, M.A. 1961, George Washington University; M.A. 1963, Ph.D. 1966, Harvard University

Morton Frank Taragin, *Associate Professor of Physics*
B.S. in Engr. 1965, M.Phil. 1969, Ph.D. 1970, George Washington University

Barbara Christ Taylor, *Associate Professorial Lecturer in Journalism*
B.S.J. 1957, Ohio University

Thomas Clinton Teeples, *Assistant Professorial Lecturer in Statistics*
B.S. 1966, M.S.A. 1971, George Washington University

Geza Teleki, Jr., *Associate Professorial Lecturer in Anthropology*
B.A. 1967, George Washington University; M.A. 1970, Ph.D. 1977, Pennsylvania State University

Douglas Harold Teller, *Professor of Design and Graphics*
B.A. 1956, Western Michigan University; M.F.A. 1962, George Washington University

Nestor E. Terleckyj, *Professorial Lecturer in Economics*
B.S. 1953, Seton Hall University; M.A. 1955, Ph.D. 1960, Columbia University

Charles J. Testa, *Associate Professor of Management Science*
B.S. 1964, Lafayette College; M.S. 1966, Ph.D. 1969, University of California, Los Angeles

Peter F. Thall, *Assistant Professor of Statistics*
B.S. 1971, Michigan State University; M.S. 1973, Ph.D. 1975, Florida State University

Jean-François Marie Thibault, *Assistant Professor of French*
Baccalaureat 1960, Licence ès Lettres 1964, Diplôme d'Etudes 1965, Academie de Paris; Ph.D. 1976, University of Maryland

Joan Elizabeth Thiel, *Associate Professor of Speech*
B.A. 1961, Marygrove College; M.F.A. 1971, Catholic University of America; Ph.D. 1975, University of Michigan

Klaus Thoenelt, *Professor of German*
Staatsexamen 1956, Ph.D. 1961, University of Freiburg

George Selby Thomas, *Lecturer in Business Administration*
B.S. 1948, U.S. Military Academy; M.S. 1968, Air Force Institute of Technology; M.B.A. 1975, George Washington University

Raymond Edward Thomas, *Associate Professor of Statistics*
B.A. 1955, M.A. 1957, M.Phil. 1971, George Washington University

Irene Thompson, *Associate Professor of Russian*
B.S. 1965, M.S. 1969, Georgetown University

Robert Leslie Thompson, *Professorial Lecturer in Forensic Sciences*
B.S. 1958, Mississippi State University; M.D. 1961, University of Mississippi; M.S. 1974, George Washington University

Ronald Bettes Thompson, *Professor of European History*
B.A. 1935, Yale University; Ph.D. 1954, University of Chicago

Shirley E. Thompson, *Adjunct Instructor in English*
B.A. 1970, Kalamazoo College; M.A. 1977, University of Michigan

*Richard Thornton, *Professor of History and International Affairs*
B.A. 1961, Colgate University; Ph.D. 1966, University of Washington

Samuel Thurm, *Professorial Lecturer in Business Administration*
B.A. 1939, Dartmouth College; M.B.A. 1941, Columbia University

James B. Thurman, *Assistant Professor of Business Administration*
B.A. 1966, M.B.A. 1972, Ph.D. 1978, Pennsylvania State University

Max David Ticktin, *Assistant Professor of Hebrew*
B.A. 1942, University of Pennsylvania; M.H.L. 1947, D.D. 1977, Jewish Theological Seminary of America

Charles Stanley Tidball, *Henry D. Fry Professor of Physiology*
B.A. 1950, Wesleyan University; M.S. 1952, University of Rochester; Ph.D. 1955, University of Wisconsin; M.D. 1958, University of Chicago

Mary Elizabeth Tidball, *Professor of Physiology*
B.A. 1951, L.H.D. 1976, Mount Holyoke College; M.S. 1955, Ph.D. 1959, University of Wisconsin; Sc.D. 1973, Wilson College; D.Sc. 1974, Trinity College (District of Columbia); HH.D. 1977, St. Mary's College (Indiana); D.Sc. 1977, Cedar Crest College; D.Sc. 1978, The University of the South; D.Sc. 1979, Goucher College; Litt.D. 1980, Regis College; Litt.D. 1980, College of Saint Catherine

Neil Avrill Tilkens, *Associate Professor of Music*
Mus.B. 1950, Columbia Union College; Mus.M. 1952, Philadelphia Conservatory of Music

Rodney Tillman, *Professor of Education*
B.A. 1943, Henderson State College; M.A. 1949, Ed.D. 1955, Columbia University

Barbara Mills Timberlake, *Associate Professorial Lecturer in Biological Sciences*
B.S. 1952, George Washington University; M.A. 1955, Amherst College

Nicholas Diggs Tiscione, *Assistant Professor of Special Education*
B.A. 1968, M.A. 1972, Ph.D. 1974, Hofstra University

George Todaro, *Adjunct Professor of Genetics*
B.A. 1958, Swarthmore College; M.D. 1963, New York University

*On sabbatical leave fall semester 1981.

Susan J. Tolchin, *Associate Professor of Public Administration*
B.A. 1961, Bryn Mawr College; M.A. 1962, University of Chicago; Ph.D. 1968, New Y
University

Margaret Cooper Tolson, *Adjunct Assistant Professor of Music*
Mus.B. 1931, Mus.M. 1936, University of Rochester

Carl Augustus Troester, Jr., *Professorial Lecturer in Human Kinetics a*
Leisure Studies
B.S. 1937, Northeast Missouri State University; M.A. 1938, University of Missouri; Ed
1942, Columbia University

Joseph Louis Tropea, *Associate Professor of Sociology*
B.A. 1962, Wayne State University; M.A. 1965, Michigan State University; Ph.D. 1973, Geo
Washington University

Lem Hoang Truong, *Associate Professor of Public Administration*
B.S. 1960, National Institute of Administration, Vietnam; M.P.A. 1968, Ph.D. 1971, Universi
of Southern California

Linda Albertson Tsantis, *Associate Professor of Special Education*
B.A. 1965, M.A. 1970, Old Dominion University; Ed.D. 1974, George Washington University

David George Tuerck, *Associate Professorial Lecturer in Economics*
B.A. 1962, M.A. 1964, George Washington University; Ph.D. 1966, University of Virginia

Colin M. Turnbull, *Professor of Anthropology and Faculty Associate fo*
Community Studies, Division of Experimental Programs
B.A. 1947, M.A. 1949, B.Litt. 1957, D.Phil. 1964, Oxford University

Mortimer Darling Turner, *Associate Professorial Lecturer in Geology*
B.S. 1943, M.S. 1954, University of California, Berkeley; Ph.D. 1972, University of Kansas

Curtis Edward Tuthill, *Associate Professor of Psychology*
B.A. 1935, Macalester College; M.A. 1936, Ph.D. 1939, University of Iowa

Alan D. Ullberg, *Associate Professorial Lecturer in Art*
B.A. 1954, Reed College; LL.B. 1960, Harvard University

Elinor Ulman, *Adjunct Associate Professor of Art Therapy*
B.A. 1930, Wellesley College; B.S. 1943, Iowa State University of Science and Technology

Stuart Umpleby, *Associate Professor of Management Science*
B.S., B.A. 1967, M.A. 1969, Ph.D. 1975, University of Illinois

George Vartkes Vahouny, *Professor of Biochemistry*
B.S. 1953, M.S. 1955, Ph.D. 1958, George Washington University

Peter B. Vaill, *Professor of Human Systems*
B.A. 1958, University of Minnesota; M.B.A. 1960, D.B.A. 1964, Harvard University

Herman Joseph Viola, *Professorial Lecturer in History*
B.A. 1960, M.A. 1964, Marquette University; Ph.D. 1970, Indiana University

Barbara Ann Von Barghahn, *Assistant Professor of Art*
B.A. 1970, University of Iowa; M.A. 1972, Ph.D. 1979, New York University

David Von Endt, *Associate Professorial Lecturer in Anthropology*
B.A. 1960, Columbia Union College; M.S. 1964, University of Maryland; Ph.D. 1975, Howard
University

Clemmont Eyvind Vontress, *Professor of Education*
B.A. 1952, Kentucky State College; M.S. 1956, Ph.D. 1965, Indiana University

Alan G. Wade, *Assistant Professor of Speech*
B.A. 1968, Northwestern University; M.A. 1972, Catholic University of America

Richard David Walk, *Professor of Psychology*
B.A. 1942, Princeton University; M.A. 1947, University of Iowa; M.A. 1949, Ph.D. 1951,
Harvard University

Glenn Anthony Walker, *Associate Professor of Biochemistry*
B.A. 1958, Bellarmine College; Ph.D. 1968, Michigan State University

Robert Harris Walker, Jr., *Professor of American Civilization*
B.S. 1945, Northwestern University; M.A. 1950, Columbia University; Ph.D. 1955, Universit
of Pennsylvania

Dewey Diaz Wallace, Jr., *Professor of Religion*
B.A. 1957, Whitworth College; B.D. 1960, Princeton Theological Seminary; M.A. 1962, Ph.D.
1965, Princeton University

Ruth Ann Wallace, *Professor of Sociology*
B.A. 1961, Immaculate Heart College; M.A. 1963, University of Notre Dame; Ph.D. 1968,
University of California, Berkeley

Raymond John Walsh, *Assistant Professor of Anatomy*
B.S. 1969, University of Massachusetts; Ph.D. 1978, Tufts University

Regis Hills Walther, *Professorial Lecturer in Management Science*
B.A. 1941, University of California, Los Angeles; M.A. 1960, Ph.D. 1963, George Washington University

George Ching Yuan Wang, *Assistant Professor of Chinese*
B.A. 1951, Taiwan Normal University; M.S. 1955, Tokyo University of Education

Ming Wang, *Lecturer in Chinese*

William Arthur Ward, *Professorial Lecturer in Management Science*
B.A. 1961, M.A. 1968, Ph.D. 1970, University of Colorado

Thomas Howard Wardlow, *Studio Lecturer in Applied Music (Percussion Instruments)*
B.S. 1962, M.S. 1964, University of Illinois

Gerald Wartofsky, *Assistant Professorial Lecturer in Art*

Charles Woodrow Washington, *Associate Professor of Public Administration*
B.A. 1968, M.P.A. 1971, Florida Atlantic University; Ph.D. 1976, Syracuse University

Don Wayne Watkins, *Associate Professor of Physiology*
B.Ch.E. 1963, University of Louisville; Ph.D. 1968, University of Wisconsin

Harry S. Watson, *Assistant Professor of Economics*
B.A. 1971, Indiana University

*Stephen Jay Wayne, *Professor of Political Science and Public Affairs*
B.A. 1961, University of Rochester; M.A. 1963, Ph.D. 1968, Columbia University

Cynthia Louise Weber, *Assistant Professorial Lecturer in Geography*
B.A. 1975, M.A. 1976, University of Kentucky

Ann Gordon Webster, *Lecturer in Anthropology*
B.A. 1950, Wellesley College; M.A. 1979, George Washington University

Lawrence Howard Wechsler, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1967, Pennsylvania State University; J.D. 1970, George Washington University

Susan B. Welchman, *Associate Professorial Lecturer in Journalism*
B.F.A. 1970, Philadelphia College of Art

Elizabeth Fortson Wells, *Assistant Professor of Botany*
B.A. 1965, Agnes Scott College; M.A. 1970, Ph.D. 1977, University of North Carolina

Peter Werres, *Associate Professorial Lecturer in German*
M.Phil. 1972, Ph.D. 1977, George Washington University

Harvey Robert Wertlieb, *Professorial Lecturer in Health Services Administration*
B.A. 1961, M.B.A. 1964, George Washington University

Harry Miles West III, *Professorial Lecturer in Public Administration*
B.A. 1963, University of Maryland; M.S. 1967, D.P.A. 1973, George Washington University

Briggs J. White, *Professorial Lecturer in Forensic Sciences*
B.A. 1932, D.C.L. 1965, Sterling College; M.A. 1936, Ph.D. 1940, University of Colorado

David Gover White, *Professor of Chemistry*
B.Ch.E. 1950, Cornell University; Ph.D. 1954, Harvard University

Jane Elizabeth White, *Studio Lecturer in Applied Music (Voice)*
Mus.B. 1950, University of Rochester; M.A. 1963, American University

Richard Otis White, *Studio Lecturer in Applied Music (Oboe)*
Mus.B. 1950, University of Rochester

John Theodore Wieseman, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1958, Wesleyan University; LL.B. 1963, Columbia University

Garland Dean Wiggs, *Associate Professor of Education*
B.B.A. 1956, University of Cincinnati; M.A. 1960, University of Northern Colorado; Ed.D. 1971, George Washington University

Donna Dale Wilkinson, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1973, University of California, Santa Barbara

*On sabbatical leave academic year 1981-82.

Brien R. Williams, *Assistant Professor of Speech*
B.A. 1963, University of California, Berkeley; M.A. 1972, San Francisco State Universi
Ph.D. 1976, Northwestern University

Ellen Reeder Williams, *Assistant Professor of Art*
B.A. 1969, Wellesley College; M.A. 1972, Ph.D. 1974, Princeton University

Jane Carol Boreman Williams, *Lecturer in English*
B.A. 1961, Wake Forest University; M.A. 1980, George Washington University

Katherine Johnston Williams, *Assistant Professor of Art Therapy*
B.A. 1962, University of Wisconsin; M.A. 1977, George Washington University

Robert Crumpton Willson, *Associate Professor of Journalism*
B.A. 1951, George Washington University

Lawrence Winkler, *Professor of Education*
B.S. 1952, M.A. 1954, Washington University; Ed.D. 1965, George Washington University

Erik Kenelm Winslow, *Associate Professor of Behavioral Sciences*
B.S. 1963, Pennsylvania State University; M.S. 1965, Ph.D. 1967, Case Western Reserve Un
versity

Maida Rust Withers, *Associate Professor of Human Kinetics and Leisure Studies*
B.A. 1958, Brigham Young University; M.S. 1960, University of Utah

Sharon Lee Wolchik, *Assistant Professor of International Affairs and Political Science*
B.A. 1970, Syracuse University; M.A. 1972, Indiana University; Ph.D. 1978, University of
Michigan

Thomas William Wolfe, *Professorial Lecturer in International Affairs*
B.A. 1935, Hiram College; M.A. 1950, Columbia University; Ph.D. 1955, Georgetown University

Kirk Marcus Wolter, *Associate Professorial Lecturer in Statistics*
B.A. 1970, St. Olaf College; M.S. 1972, Ph.D. 1974, Iowa State University

Wendy Woodson, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1969, M.A. 1977, George Washington University

William Thomas Woodward, *Assistant Professor of Painting*
B.A. 1957, M.A. 1961, American University

Gail B. Wright, *Adjunct Instructor in Accounting*
B.A. 1964, College of William and Mary; M.S. 1978, Virginia Commonwealth University

George Ernest Wright, Jr., *Assistant Professor of Economics*
B.A. 1962, College of Wooster; M.A. 1964, Ph.D. 1977, University of Michigan

John Franklin Wright, Jr., *Associate Professor of Drawing and Graphics*
B.A. 1954, American University; M.A. 1960, University of Illinois

Shirley Minkewitz Wright, *Adjunct Assistant Professor of English*
B.S. 1954, Winona State University; M.A. 1963, University of Michigan; Ph.D. 1971, George
town University

William Ralph Wright, *Studio Lecturer in Applied Music (Clarinet and Saxophone)*
Diploma 1951, Curtis Institute of Music; Mus.M. 1971, Catholic University of America

Suzanne Alison Wyman, *Associate Professor of Education*
B.S. 1967, Richmond Technical Institute; M.S.R.C. 1969, Virginia Commonwealth University
Ph.D. 1974, University of North Carolina

Helen Bates Yakobson, *Professor of Russian*
B.S. 1935, Harbin Law School, Manchuria

Matthew G. Yeager, *Assistant Professorial Lecturer in Forensic Sciences*
A.B.Crim. 1972, University of California, Berkeley

Harry Elwood Yeide, Jr., *Professor of Religion*
B.A. 1953, Williams College; B.D. 1957, Union Theological Seminary; Ph.D. 1966, Harvard
University

Anthony Marvin Yezer, *Associate Professor of Economics*
B.S. 1966, Dartmouth College; M.S. 1967, London School of Economics and Political Science
Ph.D. 1974, Massachusetts Institute of Technology

Richard Yi-chang Yin, *Associate Professor of Economics*
LL.B. 1946, Fu Jen University, China; M.A. 1950, University of Denver; Ph.D. 1966, Columbia
University

Meira Ellen Zedek, *Associate Clinical Professor of Psychology*
B.A. 1953, Hebrew University, Israel; M.A. 1954, Ph.D. 1958, Boston University

Betty Zeiger, *Clinical Instructor in Art Therapy*
B.A. 1962, M.A. 1964, American University

Steven J. Zeitlin, *Assistant Professorial Lecturer in American Civilization and Anthropology*
B.S. 1969, University of Pennsylvania; M.A. 1972, Bucknell University

Isidore Zietz, *Professorial Lecturer in Geology*
B.S. 1939, M.S. 1940, City University of New York, City College

Judith K. Zilczer, *Associate Professorial Lecturer in American Civilization*
B.A. 1969, M.A. 1971, George Washington University; Ph.D. 1975, University of Delaware

Isaiah Morris Zimmerman, *Associate Clinical Professor of Psychology*
B.A. 1951, M.S.W. 1953, University of California, Berkeley; Ph.D. 1967, Catholic University of America

John Edmund Ziolkowski, *Associate Professor of Classics*
B.A. 1958, Duke University; Ph.D. 1963, University of North Carolina

Bernard Charles Zook, *Associate Professor of Pathology (Comparative)*
B.S. 1962, D.V.M. 1963, Colorado State University

Artley Joseph Zuchelli, *Professor of Physics*
B.A. 1955, Ph.D. 1958, University of Virginia

Evenor Zuniga, *Assistant Professorial Lecturer in Education*
B.A. 1949, Knox College; M.A. 1950, Northwestern University; Ed.D. 1973, George Washington University

Jack Zwick, *Professor of Business Administration*
B.A. 1959, D.B.A. 1964, Harvard University; M.B.A. 1961, George Washington University

CONSULTANTS IN RESEARCH—GRADUATE SCHOOL OF ARTS AND SCIENCES

Robert S. Adelstein, *Head, Section on Molecular Cardiology, Cardiology Branch, National Heart, Lung, and Blood Institute;* Biochemistry (Structure and Function of Contractile Proteins)
B.A. 1955, Princeton University; M.D. 1959, Harvard University

James Adkins, *Chief, Nutritional Sciences Branch, Division of Nutrition, U.S. Food and Drug Administration;* Biological Sciences (Nutrient Bioavailability)
B.S. 1953, Virginia State College; M.S. 1958, Ph.D. 1961, University of Wisconsin

Elizabeth Potts Anderson, *Research Biochemist, Laboratory of Biochemistry, National Cancer Institute;* Metabolism of Purines and Pyrimidines
B.A. 1945, Sarah Lawrence College; M.S. 1947, University of Wisconsin; Ph.D. 1951, Stanford University

Aftab Ahmed Ansari, *Head, Cellular Immunology Division, Naval Medical Research Institute, National Naval Medical Center;* Microbiology (Immunology)
B.S. 1961, D.J. Government Science College, Pakistan; M.S. 1963, University of Karachi; M.S. 1967, University of California, Los Angeles; Ph.D. 1970, University of Arizona

Richard Asofsky, *Head, Experimental Pathology Section, National Institute of Arthritis, Metabolism, and Digestive Diseases;* Immunology
M.D. 1958, State University of New York

William Back, *Research Hydrologist, U.S. Geological Survey;* Geology (Hydrogeology)
B.S. 1948, University of Illinois; M.S. 1955, University of California, Berkeley; M.P.A. 1956, Harvard University; Ph.D. 1969, University of Nevada

erry Laurens Barnard, *Curator, Division of Crustacea, U.S. National Museum of Natural History, Smithsonian Institution;* Crustacean Bi-ology
B.A. 1949, M.S. 1950, Ph.D. 1953, University of Southern California

oseph Bellanti, *Professor of Pediatrics and of Microbiology, Georgetown University School of Medicine;* Microbiology (Immunology)
B.S. 1954, M.D. 1958, State University of New York at Buffalo

Larry Bilker, *Chief Psychologist, Bradley Day Hospital, Rhode Islan*
Psychology (Family and Child Diagnosis and Therapy)
B.A. 1960, City University of New York, Brooklyn College; M.A. 1966, Ph.D. 1970, Univ
sity of Florida

Ethel Joan Blanchette-Mackie, *Director, Electron Microscopy Laborato*
Section for Nutrition and Endocrinology, National Institute of Arthri
Metabolism and Digestive Diseases; Biology of Lipids
B.S. 1956, City University of New York, Queens College; M.S. 1959, New York Univers
Ph.D. 1965, Columbia University

Larry Bockstahler, *Chief, Pathologic Studies Section, Division of Biologi*
Effects, Bureau of Radiological Health, Food and Drug Administrati
U.S. Department of Health, Education and Welfare/Public Health Ser
ice; Genetics (Radiation Bio-effects)
B.S. 1956, Michigan State University; M.S. 1961, Ph.D. 1964, University of Wisconsin

Charles Boone, *Head, Cell Biology Section, Viral Biology Branch, Natio*
Cancer Institute; Microbiology (Virology)
M.D. 1951, University of California, San Francisco; Ph.D. 1963, University of California,
Angeles

Wallace Bowman, *Chief, Environment and Natural Resources Policy Di*
sion and Senior Specialist in Environmental Policy, Congressional R
search Service, Library of Congress; American Civilization (Man, N
ture and Environment)
B.A. 1949, M.S. 1953, Washington University; M.A. 1956, Yale University

Murray Frederick Brennan, *Head, Surgical Metabolism Section, Surg*
Branch, National Cancer Institute; Biochemistry (Surgical Science)
B.S. 1961, University of New Zealand; M.B.Ch.B. 1964, University of Otago, New Zealand

Milton Brightman, *Head, Section on Neurocytology, Laboratory of Neu*
pathology and Neuroanatomical Sciences, National Institute of Neu
logical Diseases; Anatomy (Neuroanatomy)
B.S. 1945, M.A. 1948, University of Toronto, Canada; Ph.D. 1954, Yale University

Barry L. Brown, *Research Chemist, Federal Bureau of Investigation, U*
Department of Justice; Biological Sciences (Testosterone Metabolites)
B.S. 1966, M.S. 1968, University of Georgia; Ph.D. 1972, Purdue University

Stephen Wheeler Burks, *Senior Staff Associate, National League of Cit*
State and Local Politics
B.A. 1962, Stanford University; M.A. 1969, Ph.D. 1972, Michigan State University

Charles Philip Butcher, *Professor of English and Dean of the Gradu*
School, Morgan State College; American Civilization (Afro-Americ
Literature and History)
B.A. 1942, M.A. 1947, Howard University; Ph.D. 1956, Columbia University

Cary Carson, *Director of Research, Colonial Williamsburg Foundati*
American Civilization (Vernacular Architecture)
B.A. 1963, Carleton College; M.A. 1965, University of Delaware; Ph.D. 1974, Harvard
versity

Keven John Catt, *Chief, Reproduction Branch, National Institute of C*
Health and Human Development; Endocrine Pharmacology
B.S. 1956, M.D. 1960, University of Melbourne, Australia; Ph.D. 1967, Monash Univer
Australia

Kenneth Shueh-Shen Chang, *Head, Viral Oncogenesis Section, Laborat*
of Cell Biology, National Cancer Institute; Microbiology (Virology)
M.D. 1951, National Taiwan University; Doctor of Medical Science 1960, Tokyo Universit

Michael A. Chirigos, *Associate Branch Chief, Viral Biology Branch,*
tional Cancer Institute; Immunology
B.S. 1952, Western Maryland College; M.S. 1954, University of Delaware; Ph.D. 1957, P
—The State University

John Young Cole, Jr., *Executive Director, Center for the Book, Librar*
Congress; American Civilization
B.A. 1962, M.L.S. 1963, University of Washington; M.L.A. 1966, Johns Hopkins Univ
Ph.D. 1971, George Washington University

Bruce Collette, *Assistant Director, Bureau of Commercial Fisheries, Systematics Laboratory, Smithsonian Institution;* Biology of Fishes
B.S. 1956, Ph.D. 1960, Cornell University

Erminio Costa, *Chief, Laboratory of Preclinical Pharmacology, National Institute of Mental Health;* Neuropharmacology
M.D. 1949, Universities of Padua and Cagliari

Richard L. Cysyk, *Head, Drug Metabolism Section, Laboratory of Chemical Pharmacology, National Cancer Institute;* Pharmacology (Drug Metabolism)
B.S. 1965, University of Maryland; Ph.D. 1970, Yale University

Robert Emmett Darcy, *Political Science Department, Oklahoma State University;* Political Science (Politics and Social Change)
B.A. 1965, University of Wisconsin; M.A. 1970, Ph.D. 1971, University of Kentucky

Clyde Dawe, *Head, Comparative Oncology Section, Laboratory of Pathology, National Cancer Institute;* Biological Sciences (Oncology)
B.A. 1942, Lafayette College; M.D. 1945, Johns Hopkins University; Ph.D. 1956, University of Minnesota

John Farrar, *Senior Investigator, National Institute of Dental Research;* Microbiology (Immunology)
B.A. 1966, M.S. 1968, Miami University; Ph.D. 1972, University of Notre Dame

Mattie Rae Spivey Fox, *Chief, Minerals Section, Nutritional Sciences Branch, Division of Nutrition, U.S. Food and Drug Administration;* Biochemistry (Mineral Nutrition)
B.S. 1943, Texas Women's University; M.S. 1945, Iowa State University; Ph.D. 1953, George Washington University

John Eric Fredland, *Professor of Economics, U.S. Naval Academy;* Public Finance
B.A. 1964, Harvard University; M.A. 1966, Ph.D. 1970, University of Michigan

Ernst Freese, *Chief, Molecular Biology Laboratory, National Institute of Neurological Disorders, Communicable Diseases, and Stroke:* Biochemistry (Mutagens, Control Mechanisms, and Properties of Membranes)
Vordiplom 1948, University of Heidelberg; Diplom 1951, Ph.D. 1953, University of Gottingen

Robert M. Friedman, *Chief, Laboratory of Experimental Pathology, National Institute of Arthritis, Metabolism, and Digestive Diseases;* Experimental Pathology
B.A. 1954, Cornell University; M.D. 1958, New York University

Jerry David Gardner, *Chief, Section of Gastroenterology, Digestive Diseases Branch, National Institute of Arthritis, Metabolic and Digestive Diseases;* Physiology (Digestive Diseases)
B.A. 1962, University of Kansas; M.D. 1966, University of Pennsylvania

Robert Gibbs, Jr., *Chairman, Department of Vertebrate Zoology National Museum of Natural History, Smithsonian Institution;* Vertebrate Zoology
B.A. 1951, Ph.D. 1955 Cornell University

Frederick Richmond Goff, formerly *Chief, Rare Book Division, Reference Department, Library of Congress;* American Civilization (History of Printing and the Book)
B.A. 1937, M.A. 1939, Litt.D. 1965, Brown University

Joseph Goldstein, *Assistant Professor of Metallurgy, Department of Metallurgy and Material Science, Lehigh University;* Meteorite Study
B.S. 1960, M.S. 1962, D.Sc. 1964, Massachusetts Institute of Technology

Robert Goldstein, *Chief, Pulmonary Immunology Research Laboratory, Veterans Administration Hospital;* Microbiology (Immunology)
B.A. 1962, Brandeis University, M.D. 1966, Jefferson Medical College; Ph.D. 1976, George Washington University

James Granger, *Chief of Child Guidance Service and Director of Training, Walter Reed General Hospital;* Art Therapy
B.A. 1955, University of California, Berkeley; M.D. 1961, University of Rochester

Gordon Guroff, *Head, Section on Intermediary Metabolism, Laboratory of Developmental Neurobiology, National Institute of Child Health and Development;* Amino Acid Metabolism
B.S. 1954, University of Illinois; M.S. 1956, Auburn University; Ph.D. 1959, University of Wisconsin

Frederick Gutheim, *Chairman, Gutheim, Seelig, Erickson, Inc.;* American Civilization (Urban Studies, Historic Preservation)
B.A. 1931, University of Wisconsin

Gordon Hager, *Head, Viral Immunogenetics Section, Tumor Virus Genetics Laboratory, National Cancer Institute;* Viral Immunogenetics
B.S. 1964, University of Kansas; Ph.D. 1970, University of Washington

John Hardt, *Senior Specialist in Soviet Economics, Congressional Research Service, Economic Division, Library of Congress;* Soviet Economics (Comparative Economic Systems)
B.A. 1945, M.A. 1948, University of Washington; M.A. 1950, Ph.D. 1955, Columbia University

Robert Harmon, *Assistant Professor of Psychiatry, University of Colorado;* Child Psychiatry
B.A. 1967, Miami University; M.D. 1971, University of Colorado

Joseph Ernest Hazel, *Research Geologist, Paleontology and Stratigraphy Branch, U.S. Geological Survey;* Paleontology
B.A. 1956, M.A. 1960, University of Missouri; Ph.D. 1963, Louisiana State University and Agricultural and Mechanical College

Richard C. Henneberry, *Senior Scientist, Laboratory of Molecular Biology, National Institute of Neurological and Communicative Disorders and Stroke;* Physiology (Cellular Receptors and Membranes)
B.A. 1959, St. Michael's College; M.S. 1966, Ph.D. 1969, University of Massachusetts

Ronald Herberman, *Head, Cellular and Tumor Immunology Section, Laboratory of Cell Biology, National Cancer Institute;* Tumor Immunology
B.A. 1960, M.D. 1964, New York University

Peter N. Herbert, *Director, Division of Clinical and Experimental Atherosclerosis, The Miriam Hospital;* Biochemistry (Lipoproteins)
B.S. 1963, Rensellaer Polytechnic Institute; M.D. 1967, Yale University

Gary Hodgen, *Chief, Section on Endocrinology, Reproduction Research Branch, National Institute of Child Health and Human Development;* Physiology (Reproductive Endocrinology)
B.Sc. 1965, M.Sc. 1966, Purdue University; Ph.D. 1969, Ohio State University

Jane M. Holmes, *Staff Neuropsychologist, Department of Psychiatry, Children's Hospital Medical Center;* Psychology (Learning Disabilities)
B.A. 1968, University of Durham, England; Ph.D. 1973, University of Edinburgh, Scotland

Loren Horton, *State Historical Society of Iowa;* American Civilization (History of Iowa)
B.A. 1955, M.A. 1960, University of Northern Iowa

Richard Houbrick, *Supervisory Marine Biologist, Smithsonian Oceanographic Sorting Center, Smithsonian Institution;* Biological Sciences (Malacology)
B.A. 1959, St. Bernard College; M.S. 1967, University of Miami; Ph.D. 1971, University of South Florida

Thelma Hunt, *Professor Emeritus of Psychology;* Abnormal Psychology
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

David Jacobowitz, *Chief, Section on Histopharmacology, Laboratory of Clinical Science, National Institute of Mental Health;* Pharmacology (Neuropharmacology)
B.S. 1953, City University of New York, City College; M.S. 1958, Ph.D. 1962, Ohio State University

Meredith Leam Jones, *Curator, Division of Worms, Smithsonian Institution;* Invertebrate Zoology
B.A. 1948, M.A. 1952, Ph.D. 1956, University of California, Berkeley

Shung-chang Jong, *Head, Mycology Department, American Type Culture Collection;* Microbiology
B.S. 1960, National Taiwan University; M.S. 1966, Western Illinois University; Ph.D. 1969, Washington State University

Carl Donald Kahn, *Chief, Section on Cellular and Molecular Physiology, National Institute of Arthritis, Metabolism, and Digestive Diseases;* Cellular and Molecular Physiology
B.A. 1964, M.D. 1968, University of Louisville

Robert Konrad Kahn, *Psychotherapist (Private Practice);* Psychotherapy
B.A. 1946, University of Pennsylvania; M.A. 1953, George Washington University; Ph.D. 1957, Pennsylvania State University

Marvin W. Kranz, *Specialist in American History, Library of Congress;* American Civilization (American History)
B.A. 1951, Ph.D. 1961, Syracuse University

Floyd M. Kregenow, *Senior Member, Laboratory of Kidney and Electrolyte Metabolism, National Heart, Lung, and Blood Institute;* Membrane Transport Processes
B.S. 1957, Rutgers—The State University; M.D. 1962, Yale University

Laurence Pereira Leite, *Professor Emeritus of Art;* Art History
M.A. 1956, Ph.D. 1966, Johns Hopkins University
M.D. 1962, University of Chicago

Lawrence Stephen Lessin, *Professor of Medicine and Pathology, George Washington University School of Medicine and Health Sciences;* Physiology
M.D. 1962, University of Chicago

Robert Levy, *Director, Division of Heart and Vascular Diseases, National Heart, Lung, and Blood Institute;* Biochemistry (Lipoproteins)
B.A. 1957, Cornell University; M.D. 1961, Yale University

Marc E. Lippman, *Head, Medical Breast Cancer Section, Medicine Branch, National Cancer Institute;* Endocrinology and Metabolism
B.A. 1964, Cornell University; M.D. 1968, Yale University

Darrell Liu, *Acting Section Chief, Biochemistry of Microbial Structure, National Institute of Child Health and Human Development;* Peptides and Protein Structure
B.S. 1955, National Taiwan University; Ph.D. 1961, University of Pittsburgh

David R. Livengood, *Research Physiologist, Department of Neurobiology, Armed Forces Radiation Biology Research Institute;* Physiology of Synapse, Membrane Biophysics, and Sodium Transport Mechanisms
B.A. 1960, Butler University; Ph.D. 1970, Indiana University

Donald Lynn Loriaux, *Head, Developmental Endocrinology Section, National Institute of Child Health and Development;* Endocrine and Reproductive Pharmachology
B.S. 1962, Colorado State University; M.D. 1967, Ph.D. 1968, Baylor College of Medicine

Walter McKay Lovenberg, *Section Chief, Biochemical Pharmacology, Experimental Therapeutics Branch, National Heart, Lung, and Blood Institute;* Structure and Function of Proteins
B.S. 1956, M.S. 1958, Rutgers—The State University; Ph.D. 1962, George Washington University

Philip Lundeberg, *Curator, Division of Naval History, Smithsonian Institution;* American Civilization (Military and Naval History)
B.A. 1947, M.A. 1954, Duke University; Ph.D. 1955, Harvard University

William Madow, Statistics (Sample Survey Design)
B.A. 1932, M.A. 1933, Ph.D. 1938, Columbia University

Rose Mage, *Career Investigator, Laboratory of Immunology, National Institute of Allergy and Infectious Diseases;* Immunogenetics
B.S. 1956, Cornell University; Ph.D. 1963, Columbia University

Charles R. Manclark, *Research Microbiologist, Bureau of Biologics, Food and Drug Administration;* Microbiology (Microbial Physiology)
B.S. 1953, California State Polytechnic University; Ph.D. 1963, University of California, Los Angeles

Ronald W. Manderscheid, *Senior Research Sociologist, National Institute of Mental Health; Sociology* (Socialization and Stratification)
B.A. 1965, Loras College; M.A. 1967, Marquette University; Ph.D. 1975, University of Maryland

Peter C. Marzio, *Director, Corcoran Gallery and School of Art;* American Civilization (American Prints)
B.A. 1965, Juniata College; M.A. 1966, Ph.D. 1969, University of Chicago

Scott R. Mazzur, *Senior Research Scientist, Blood Research Laboratory, The American National Red Cross;* Microbiology (Immunology)
B.A. 1957, Rutgers—The State University (Douglass College); Ph.D. 1966, University of Pennsylvania

Barbara F. Meeker, *Associate Professor of Sociology, University of Maryland;* Sociology (Mathematical Sociology)
B.A. 1961, University of Kansas; M.A. 1964, Ph.D. 1966, Stanford University

John L. Middlebrook, *Research Chemist, Pathology Division, U.S. Army Medical Research Institute of Infectious Diseases;* Biological Sciences (Bacterial Biochemistry)
B.S. 1968, Pacific University; Ph.D. 1972, Duke University

Mortimer Mishkin, *Research Psychologist, Section on Neuropsychology, National Institute of Mental Health;* Experimental Psychology
B.A. 1946, Dartmouth College; M.A. 1949, Ph.D. 1951, McGill University

Jerry Mitchell, *Chief, Section on Clinical Pharmacology and Metabolism, Office of the Director of Intramural Research, National Heart, Lung, and Blood Institute;* Pharmacology
B.A. 1963, University of Kentucky; M.D. 1968, Ph.D. 1969, Vanderbilt University

Brian R. Murphy, *Staff Associate, Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases;* Virology
B.A. 1964, Wesleyan University; M.D. 1969, University of Rochester

Brian C. Myhr, *Section Head, Department of Genetics and Cell Biology, Litton Bionetics, Inc.;* Genetics
B.S. 1961, Ph.D. 1968, Iowa State University

William Guy Nash, *Cancer Expert, Frederick Cancer Research Center;* Biological Sciences (Genetics)
B.S. 1963, M.A. 1965, University of Michigan

Stephen Oroszlan, *Head, Immunochemistry Section, Biological Carcinogenesis Program, Frederick Cancer Research Center;* Microbiology (Virology)
M.S. 1950, Technical University, Budapest; Ph.D. 1960, Georgetown University

James Clark Osborne, Jr., *Staff Fellow, National Heart, Lung, and Blood Institute (Molecular Branch);* Genetics (Physical Chemistry of Macromolecules)
B.A. 1970, M.S. 1972, Ph.D. 1974, University of Maryland

Diane Brickley Parsons, *Assistant Research Professor of Orthopedic Surgery, George Washington University School of Medicine and Health Sciences;* Biochemistry (Collagen)
B.A. 1968, Newton College; Ph.D. 1973, Boston University

Andrew Peacock, *Supervisory Research Chemist, National Cancer Institute;* Biological Sciences (Cell Biology)
B.S. 1943, M.S. 1947, Ph.D. 1949, Massachusetts Institute of Technology

John Pisano, *Head, Section of Physiological Chemistry, Experimental Therapeutics Branch, National Heart, Lung, and Blood Institute;* Physiological Chemistry
B.S. 1951, Pennsylvania State University; M.S. 1953, Ph.D. 1955, Rutgers—The State University

John W. Porter, *Chief, Lipid Metabolism Laboratory, and Professor, Department of Physiological Chemistry, University of Wisconsin;* Biochemistry (Lipid Metabolism)
B.S. 1938, Ph.D. 1942, University of Wisconsin

Robert Miles Pratt, Jr., *Research Chemist, Craniofacial Anomalies Section, Laboratory of Developmental Biology and Anomalies, National Institute of Dental Research;* Pharmacology (Biochemical Teratogenesis)
B.A. 1965, M.A. 1966, University of Colorado; Ph.D. 1970, Boston University

Ulf Rudiger Rapp, *Visiting Scientist, Viral Oncology Program, National Cancer Institute;* Genetics (Virology)
M.D. 1969, University of Freiburg, Germany; Ph.D. 1975, University of Wisconsin

Allen Raskin, *Research Psychologist, Psychopharmacology Research Branch, National Institute of Mental Health;* Psychopharmacology
B.A. 1949, Syracuse University; M.S., Ph.D. 1954, University of Illinois

Wayne D. Rasmussen, *Leader, Agricultural Historical Program, Economic Research Service, U.S. Department of Agriculture;* History (Agricultural History)
B.A. 1937, University of Montana; M.A. 1939, Ph.D. 1950, George Washington University

Stephen A. Rosenberg, *Chief of Surgery, National Cancer Institute;* Microbiology (Immunology)
B.A. 1960, M.D. 1963, Johns Hopkins University; Ph.D. 1968, Harvard University

George S. Roth, *Research Biochemist, Gerontology Research Center, National Institute on Aging;* Gerontology Research
B.S. 1968, Villanova University; Ph.D. 1971, Temple University

Alan N. Schechter, *Chief, Section on Macromolecular Biology, Laboratory of Chemical Biology, National Institute of Arthritis, Metabolic and Digestive Diseases;* Biochemistry (Proteins)
B.A. 1959, Cornell University; M.D. 1963, Columbia University

Frank L. Schmidt, *Personnel Research Psychologist, Research Section, Personnel Research and Development, U.S. Civil Service Commission;* Psychology (Personnel Psychology)
B.A. 1966, Bellarmine College; M.S. 1968, Ph.D. 1970, Purdue University

Leonard Peter Schultz, *Curator of Fishes, Smithsonian Institution;* Vertebrate Zoology (Ichthyology)
B.A. 1924, Albion College; M.S. 1926, University of Michigan; Ph.D. 1932, University of Washington

David Segal, *Research Chemist, National Cancer Institute, National Institutes of Health;* Biochemistry (Immunoglobulins)
B.A. 1961, Oberlin College; Ph.D. 1966, Johns Hopkins University

Robert Sumner Sigafoos, *Botanist, U.S. Geological Survey;* Plant Ecology
B.S. 1942, M.S. 1943, Ohio State University; M.A. 1949, Ph.D. 1951, Harvard University

Lyman Bradford Smith, *Senior Botanist, Department of Botany, Smithsonian Institution;* Plant Taxonomy
B.A. 1925, M.A. 1928, Ph.D. 1930, Harvard University

Louis Sokoloff, *Chief, Laboratory of Cerebral Metabolism, National Institute of Mental Health;* Biochemistry (Brain Biochemistry)
B.A. 1943, M.D. 1946, University of Pennsylvania

Michael B. Sporn, *Chief, Laboratory of Chemoprevention, National Cancer Institute;* Pharmacology (Carcinogenesis and Cancer Chemotherapy)
B.S. 1952, Harvard University; M.D. 1959, University of Rochester

Thressa C. Stadtman, *Head, Section on Intermediary Metabolism and Bioenergetics, Laboratory of Biochemistry, National Heart, Lung, and Blood Institute;* Biochemistry (Intermediary Metabolism)
B.S. 1940, M.S. 1942, Cornell University; Ph.D. 1949, University of California

John R. Stephenson, *Head, Viral Genetics Section, National Cancer Institute;* Virology
B.S. 1965, University of British Columbia; M.S. 1968, University of Guelph, Canada; Ph.D. 1970, University of Toronto

Sarah Stewart, *Medical Director, Human Virus Leukemia Section, National Cancer Institute;* Viral Leukemia
B.S. 1927, New Mexico State University; M.S. 1930, University of Massachusetts; Ph.D. 1939, University of Chicago; M.D. 1949, Georgetown University

Keith Larry Storrs, *Analyst in Latin American Affairs, Congressional Research Service, Library of Congress;* Political Science (Latin American Government and Politics)
B.A. 1962, Brigham Young University; Ph.D. 1972, Cornell University

Celia White Tabor, *Staff Member, Laboratory of Biochemical Pharmacology, National Institute of Arthritis, Metabolism, and Digestive Diseases;* Biochemistry (Intermediary Metabolism)
B.A. 1940, Radcliffe College; M.D. 1943, Columbia University

Herbert Tabor, *Chief, Laboratory of Biochemical Pharmacology, National Institute of Arthritis, Metabolism, and Digestive Diseases;* Biochemistry (Intermediary Metabolism)
B.A. 1937, M.D. 1941, Harvard University

John F. Tallman, *Head, Section of Biochemistry and Pharmacology, National Institute of Mental Health;* Biochemistry (Complex Lipids)
B.S. 1968, Ph.D. 1972, Georgetown University

Robert Ting, *Scientific Director, Biotech Research Laboratories;* Virology
B.A. 1954, M.A. 1956, Amherst College; Ph.D. 1960, University of Illinois

Robert W. Wannemacher, Jr., *Senior Biochemist, Biochemistry and Nutrition, U.S. AMRIID, Fort Detrick;* Biochemistry (Biochemistry and Nutrition)
B.S. 1950, Wagner College; M.S. 1951, Ph.D. 1960, Rutgers—The State University

Wilcomb Edward Washburn, *Director, Office of American Studies, Smithsonian Institution;* American Civilization
B.A. 1948, Dartmouth College; Ph.D. 1955, Harvard University

Robert Louis Weintraub, *Professor Emeritus of Botany;* Biology
B.S. 1931, M.A. 1933, Ph.D. 1938, George Washington University

Stanley Howard Weitzman, *Curator of Fishes, Smithsonian Institution;* Biological Sciences (Ichthyology)
B.A. 1951, M.A. 1953, University of California, Berkeley; Ph.D. 1960, Stanford University

Jerry Randall Williams, *Research Professor of Radiology and of Pharmacology;* Pharmacology
B.A. 1957, Texas Christian University; B.Sc. 1960, M.Sc. 1960, National University of Ireland; D.Sc. 1972, Harvard University

FIELD OF STUDIES CONSULTANTS— GRADUATE SCHOOL OF ARTS AND SCIENCES

Robert V. Allen, *Soviet Area Specialist, Library of Congress;* U.S. and Russian Institutions in Social Change
B.Ed. 1943, Southern Illinois University; M.A. 1945, Ph.D. 1950, Yale University

Donna Ari, *Curator of Education, Corcoran Gallery of Art;* Museum Training
B.A. 1961, University of Connecticut

Thomas Bower, *Assistant Registrar for the Permanent Collection, National Collection of Fine Arts, Smithsonian Institution;* Museum Training
B.A. 1970, University of Notre Dame

Irving Breger, Research Chemist, *Coal Resources Branch, U.S. Geological Survey;* Organic Geochemistry
B.S. 1941, Worcester Polytechnic Institute; M.S. 1947, Ph.D. 1950, Massachusetts Institute of Technology

Joseph Carr, *Administrator, Carlyle House Historic Park;* Museum Training
B.A. 1972, Centre College of Kentucky

Grose Evans, *Curator, Loans and Exhibitions, National Gallery of Art;* American Civilization (English Art History)
B.F.A. 1941, M.A. 1942, Ohio State University; Ph.D. 1953, Johns Hopkins University

Jean Federico, *Curator, DAR Museum;* Museum Training
B.A. 1962, Northwestern University; M.A. 1963, University of Michigan

Alan Fern, *Chief, Prints and Photographs Division, Library of Congress;* American Civilization (American and European Cinema)
B.A. 1950, M.A. 1954, Ph.D. 1960, University of Chicago

Janet Flint, *Curator, Department of Prints and Drawings, National Collection of Fine Arts, Smithsonian Institution;* Museum Training
B.S. 1957, University of Louisville; M.A. 1969, University of Minnesota

Joseph Fulton, *Specialist in Labor Economics and Relations, Congressional Research Service, Library of Congress;* American Civilization (Labor History)
B.A. 1946, M.A. 1948, New York University

Susan Hobbs, *Joint Curator, National Collection of Fine Arts and Freer Gallery, Smithsonian Institution;* Museum Training
B.A. 1968, Scripps College; Ph.D. 1974, Cornell University

Harry J. Hogan; American Civilization (American Legal History)
B.A. 1937, Princeton University; LL.B. 1947, Columbia University; Ph.D. 1971, George Washington University

Alan Jabbour, *Director, Folk Arts Division, National Endowment for the Arts;* American Civilization (Folk Music)
B.A. 1963, University of Miami; M.A. 1966, Ph.D. 1968, Duke University

John Bennett Kuiper, *Head, Motion Picture Section, Division, Prints and Photographs, Library of Congress;* American Civilization (Mass Media—Movies and Television)
B.A. 1950, University of Kentucky; M.A. 1957, Ph.D. 1960, University of Iowa

Alison MacTavish, *Curator of the Octagon House;* Museum Training
B.A. 1968, Boston University; M.A. 1969, State University of New York College at Oneonta

Vernon McKay, *Professor of African Studies, School for Advanced International Studies, Johns Hopkins University;* African History
B.A. 1933, Baker University; M.A. 1934, Syracuse University; Ph.D. 1939, Cornell University

Ellen Myette, *Assistant Curator, Renwick Gallery, National Collection of Fine Arts, Smithsonian Institution;* Museum Training
B.A. 1968, The Western College

James Newcome Norris IV, *Associate Curator, Algae Department of Botany, National Museum of Natural History, Smithsonian Institution;* Biology (Marine Botany)
B.A. 1968, M.A. 1971, San Francisco State College; Ph.D. 1975, University of California, Santa Barbara

James Clark Osborne, Jr., *Staff Fellow, National Heart, Lung, and Blood Institute, Molecular Disease Branch;* Genetics (Molecular Diseases)
B.A. 1970, M.S. 1972, Ph.D. 1974, University of Maryland

Harry Z. Rand, *Associate Curator, Twentieth Century Department, National Collection of Fine Arts, Smithsonian Institution;* Museum Training
B.A. 1969, City University of New York, City College; M.A. 1971, Ph.D. 1974, Harvard University

Neil L. Sass, *Division of Toxicology, Bureau of Foods, Food and Drug Administration;* Biochemistry (Food Toxicology)
B.S. 1966, Wake Forest College; Ph.D. 1971, West Virginia University

Samuel I. Shibko, *Chief, Natural and Environmental Toxicants Branch, Division of Toxicology, Bureau of Foods, Food and Drug Administration;* Biochemistry (Food Toxicology)
B.Sc. 1954, University of Birmingham, England; Ph.D. 1958, University of London

Paul C. Spehr, *Assistant Chief, Motion Picture, Broadcasting, and Recorded Sound Division, Library of Congress;* American Civilization (American Cinema)
B.A. 1952, Kenyon College

Julian Wood Witherell, *Head, African Section, Library of Congress;* American Civilization (African History)
B.A. 1956, Bowdoin College; M.A. 1958, Ph.D. 1964, University of Wisconsin

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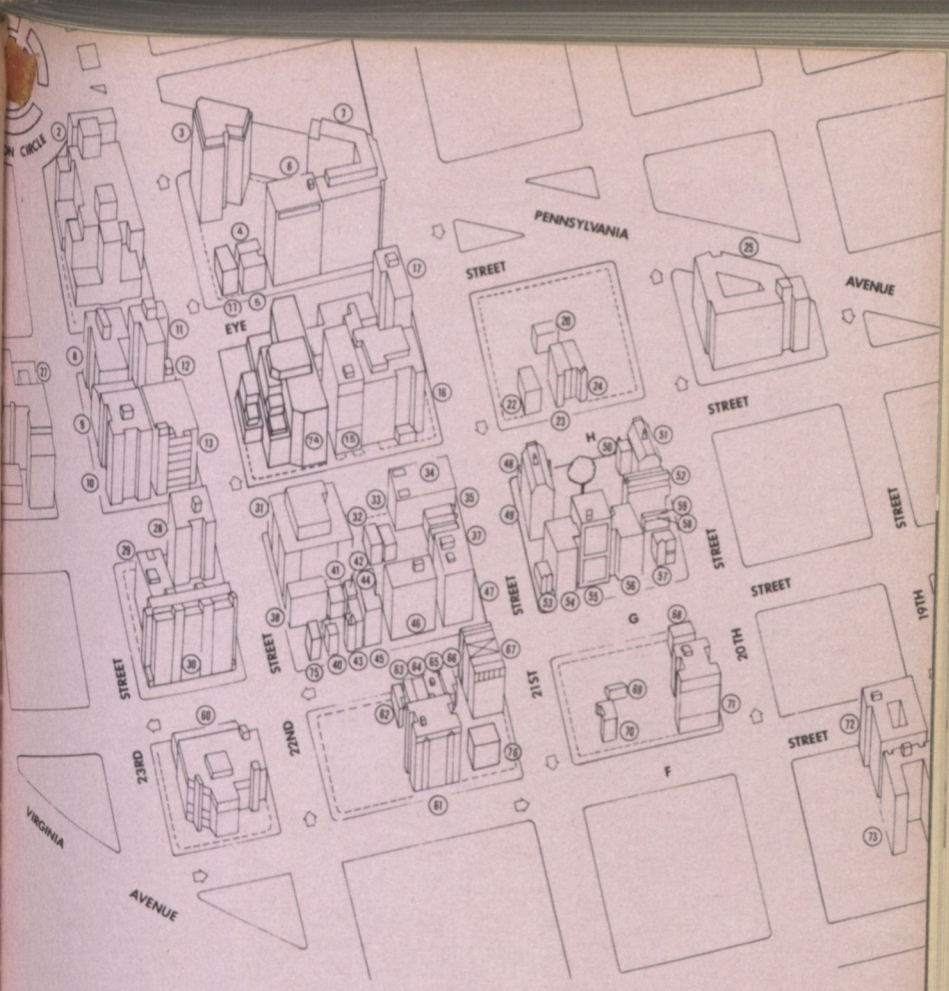

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74	Lisner Hall, 2023 G St.	55	Bldg. C, 2201 G St.	30	Bldg. X, 2112 G St.	63	
37	Madison Hall, 736 22nd St.	28	Bldg. D, 2129 G St.	43	Bldg. Y, 2131 G St.	40	
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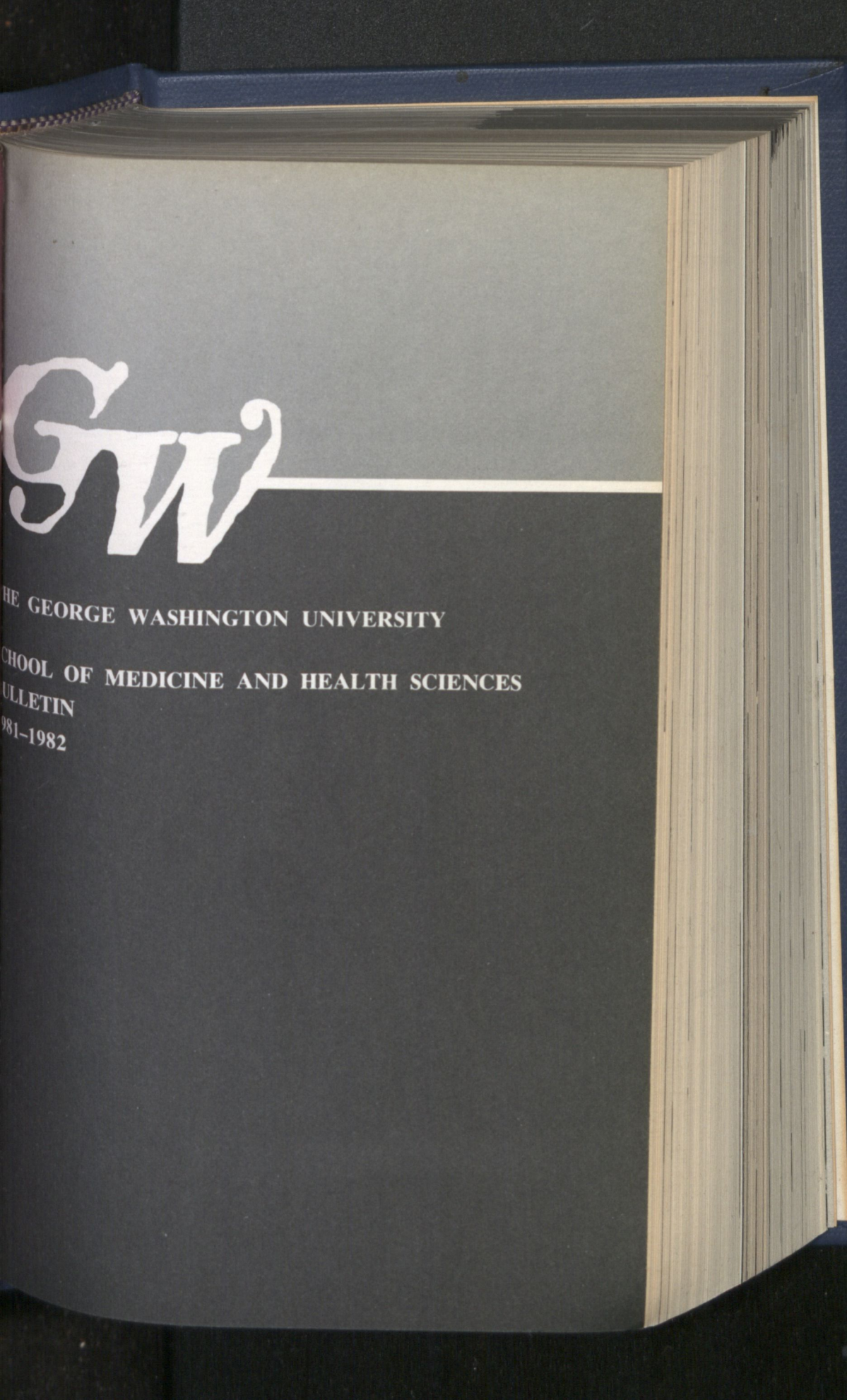
17	(H.B. Burns Memorial Bldg.),		Bldg. H, 2000 G St.	68	Bldg. BB, 2114 G St.	62	
49	2150 Pennsylvania Ave.		Bldg. J, 2131 G St. (rear)	41	Bldg. CC, 2035 H St.	22	
13	Mitchell Hall, 514 19th St.	73	Bldg. K, 817 23rd St.	9	Bldg. DD, 2019-25 H St. (rear)	20	
25	Monroe Hall, 2115 G St.	46	Bldg. L, 2129 G St. (rear)	42	Bldg. EE, 2129-33 Eye St. (rear)	4	
10	Munson Hall, 2212 Eye St.	11	Bldg. N, 718 21st St.	35	Bldg. FF, 2023 H St.	24	
47	Parking		Bldg. O, 2106 G St.	66	Bldg. GG, 2125 G St.	44	
	Marvin Center, 800 21st St.	16	Bldg. P, 2108 G St.	65	Bldg. HH, 2127 G St.	45	
60	University Garage, 2211 H St.	13	Bldg. R, 712 20th St.	59	Bldg. II, 2206 Eye St.	12	
9	Rice Hall, 2121 Eye St.	6	Bldg. S, 2025 H St.	23	Bldg. JJ, 2031 F St.	70	
7	Ross Hall, 2300 Eye St.	26	Bldg. T, 2110 G St.	64	Bldg. NN, 2025 H St. (rear)	22	
2	Samson Hall, 2036 H St., 729 21st St.	48	Bldg. U, 2023 H St. (rear)	24	Bldg. RR, 2145 Eye St.	77	
43	Smith Center, 600 22nd St.	60	Bldg. V, 2114 H St. (rear)	33	Bldg. SS, 2141 G St.	75	
71	Staughton Hall, 707 22nd St.	38	Bldg. W, 2024-26 G St. (rear)	69	Bldg. TT, 600 21st St.	76	
	Stockton Hall, 720 20th St.	51					
52	Strong Hall, 620 21st St.	67					
	Stuart Hall, 2013 G St.	56					
27	Thurston Hall, 1900 F St.	72					
31	Tompkins Hall, 725 23rd St.	29					
34	Warwick Bldg., 2300 K St.						
	Woodhull House, 2033 G St.	53					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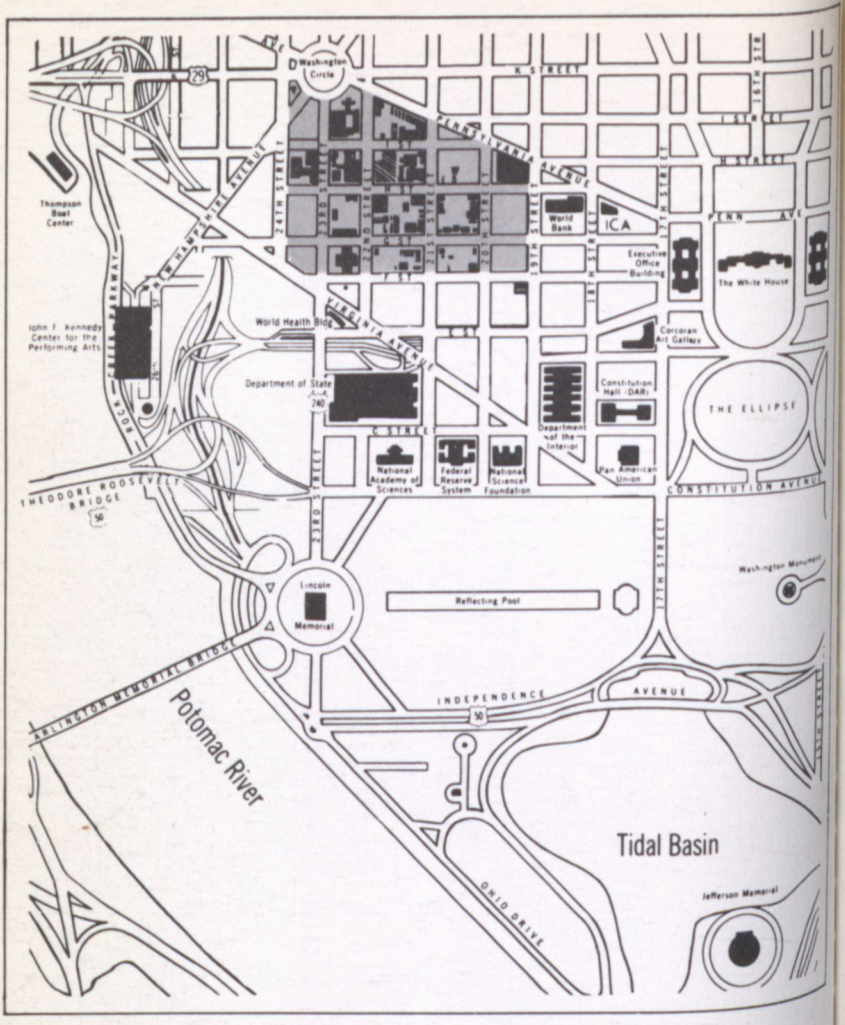

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SCHOOL OF MEDICINE AND HEALTH SCIENCES BULLETIN
March, 1981

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THE GEORGE WASHINGTON UNIVERSITY

SCHOOL OF MEDICINE AND HEALTH SCIENCES BULLETIN

1981–1982

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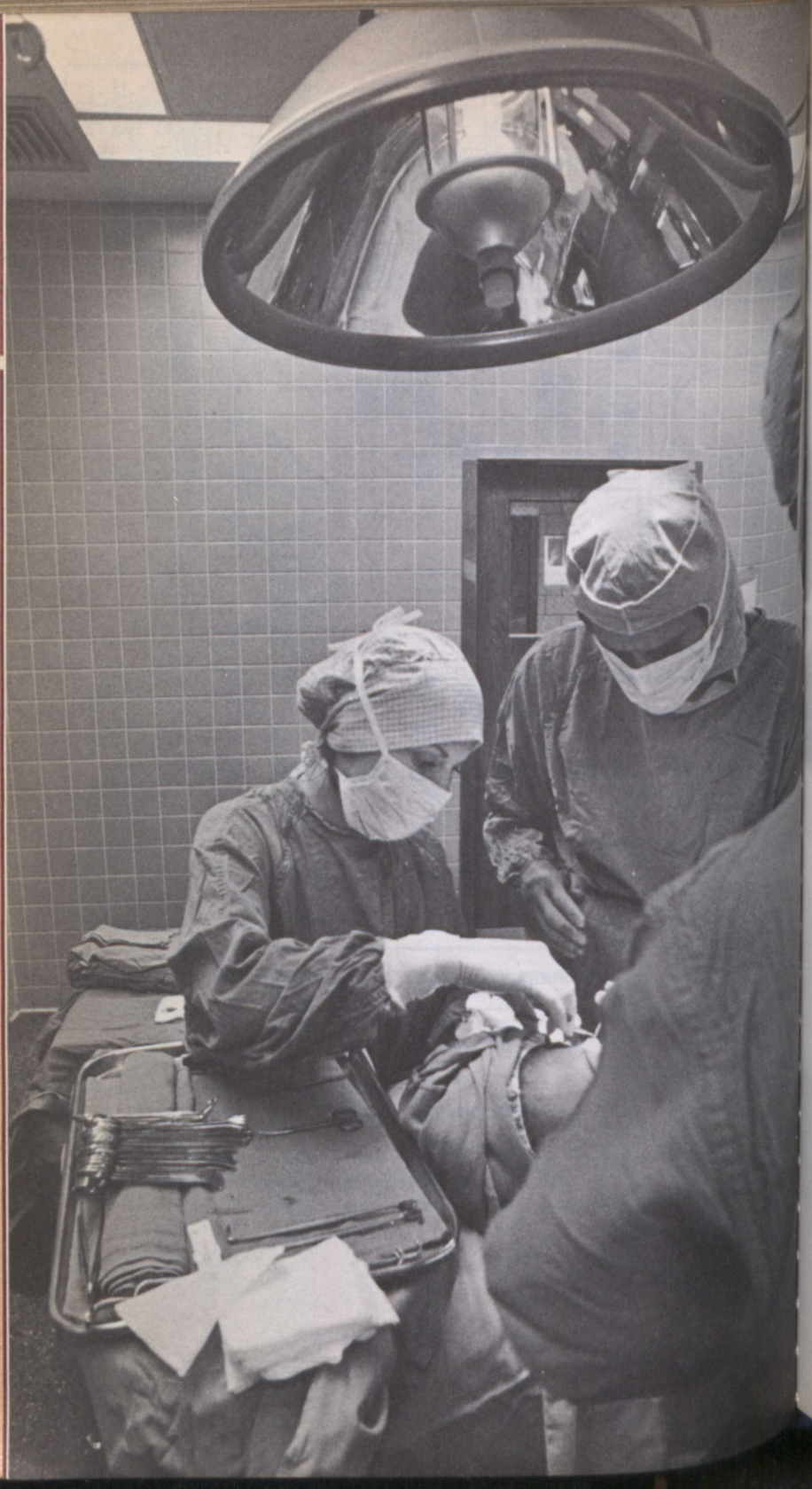

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THE CALENDAR 1981–1982*

AUGUST 1981

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August 26–28	Orientation, *Wednesday–Friday*
August 31	First day of classes, *Monday*
September 1	Registration, *Tuesday*
September 7	Labor Day—holiday for first- and second-year students, *Monday*
November 25	Thanksgiving vacation begins after classes for first- and second-year students, *Wednesday*
November 30	Return from vacation, *Monday*
December 18	Winter vacation begins after classes, *Friday*
January 4	Classes resume, *Monday*
January 8	Spring Registration, *Friday*
February 15	Washington's Birthday—holiday for first- and second-year students, *Monday*
March 12	Spring break begins after classes for first- and second-year students, *Friday*
March 14	Spring break begins for third-year students at 5:00 p.m., *Sunday*
March 22	Return to classes, *Monday*
May 21	Last day of classes, *Friday*
May 24–28	Examination period, *Monday–Friday*
May 28	Commencement, *Friday*
June 27	End of third-year clerkships, *Sunday*

* This Calendar is subject to change. Although registration is conducted in both August and January, there is no precise date for the end of the fall semester; some courses end before the winter recess while others begin before the January registration.

THE UNIVERSITY

HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period,

the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. Within a few blocks are the White House, the Department of the Interior, the State Department, the World Bank, and many other governmental offices and international agencies. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; the College of General Studies; the Division of University and Summer Students; and the Division of Experimental Programs.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an *ex officio* member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board. The Department of Chemistry is on the approved list of the American Chemical Society.

The School of Medicine and Health Sciences has had continuous approval by the Council on Medical Education of the American Medical Association and the Association of American Medical Colleges. The Doctor of Medicine degree of the School of Medicine and Health Sciences is recognized by all state and territorial medical licensure boards in the United States.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and

activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the academic departments, and other student and faculty organizations.

The Center Governing Board, representative of all elements of the University community, plays an important role in the day-to-day functioning of the center. This board works closely with the full-time staff in the development of procedures and policies which provide a framework for the center's operation.

RECREATION

The nation's capital provides abundant recreational resources, a large number of which are available at little or no cost. There are numerous art galleries, museums, concert halls, theaters, swimming pools, parks, and places of great historic interest. Social activities are provided by student organizations of the University, the School of Medicine and Health Sciences, and University-sponsored programs such as intramural sports, concerts, recitals, and dramatic productions. Religious faiths are well-represented in the Washington metropolitan area. Washington is one of the most colorful cultural and scientific centers of the world.

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* Alumni trustee.

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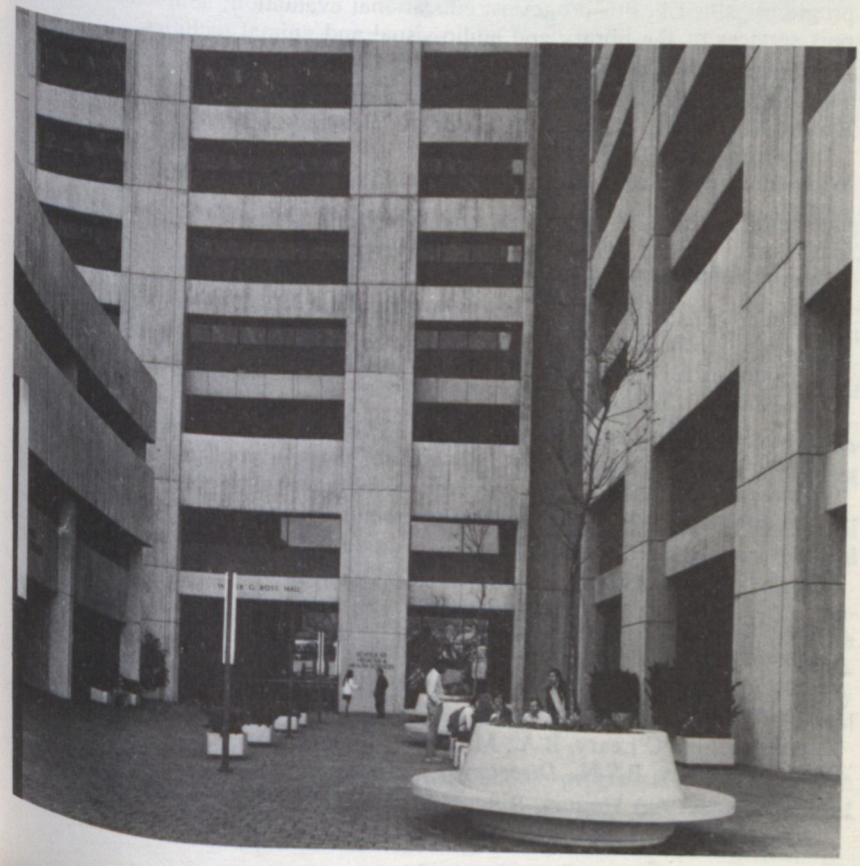
Joseph Young Ruth, B.A., *Director of Admissions*
Robert Gebhardtsbauer, M.A., *Registrar*



THE SCHOOL OF MEDICINE AND HEALTH SCIENCES

OFFICERS OF ADMINISTRATION OF THE MEDICAL CENTER

Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs and Executive Dean of the Medical Center*

Office of Academic Affairs

The Office of Academic Affairs bears the responsibility for the curriculum; student affairs, including scholarship and financial aid; research and sponsored programs; allied health programs; educational evaluation; admissions; and support services of the library and audio-visual and animal facilities.

Lawrence Thompson Bowles, M.D., Ph.D., *Dean for Academic Affairs*
Fred Leonard, Ph.D., *Associate Dean for Research*
Robert Keimowitz, M.S., M.D., *Associate Dean for Student Affairs and Admissions*
Winfield Harker Scott, Ph.D., *Associate Dean for Education and Director of Education*

Office of Administrative Affairs

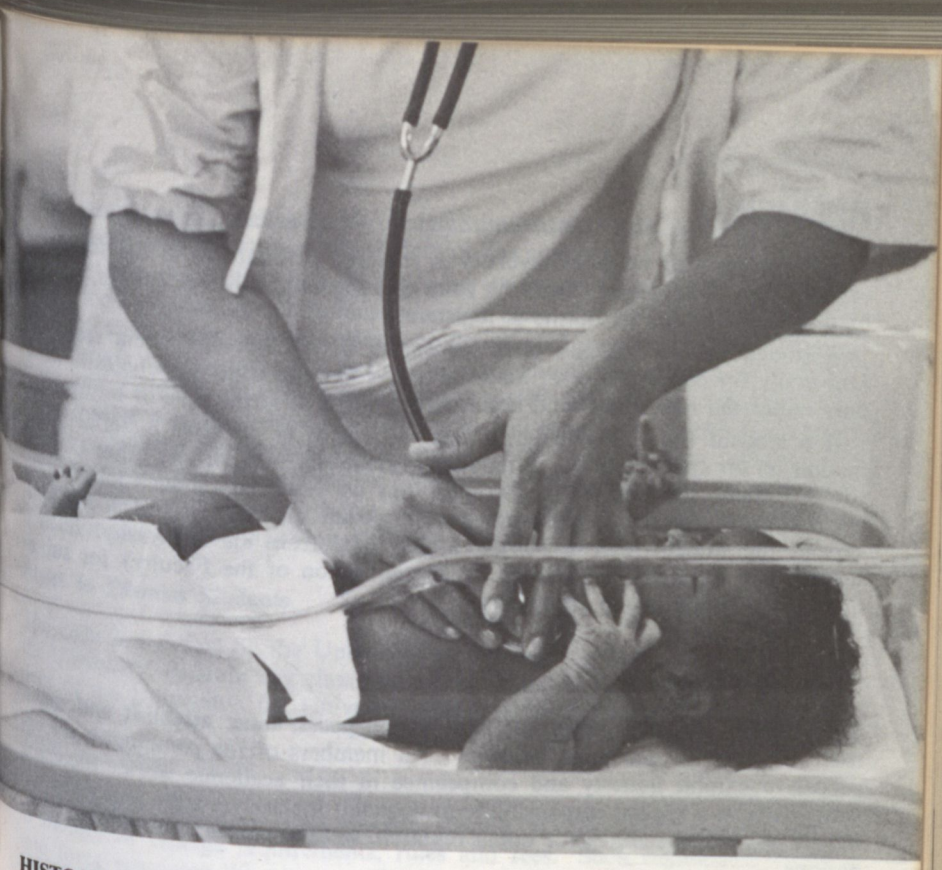
The Office of Administrative Affairs is responsible for the administration of the University Hospital and the Medical Faculty Associates, for support services to the School of Medicine and Health Sciences, and for the financial management of the Medical Center.

Philip Stanley Birnbaum, M.S. in M.E., B.C.E., *Dean for Administrative Affairs*
Michael M. Barch, M.B.A., *Administrator of the Medical Center*
Thomas James Carroll, B.A., *Director of Financial Services*
Bruce Johnson Dietz, B.A., M.S., *Director of Management Information*

Office of Clinical Affairs

The Office of Clinical Affairs is responsible for the patient care activities of the University Hospital and the Medical Faculty Associates and for the supervision of the graduate and continuing medical education programs and community affiliation programs.

Dennis Sophian O'Leary, B.A., M.D., *Dean for Clinical Affairs*
Sheila McCarthy, B.S.N., *Director of Nursing*
Robert James Van Houten, B.S., M.D., *Associate Dean for Graduate Medical Education*



HISTORY

The School of Medicine and Health Sciences of George Washington University has a distinguished history that goes back more than a century. In March, 1825, the School opened with the intention of building "a medical school commensurate with the progress and demands of a rising metropolis, and the improvement of service throughout the country." The School, the eleventh oldest medical school in the country, has met this responsibility by providing its students with a foundation in the medical sciences upon which they have built medical careers in practice, teaching, research, or administration.

In 1844 the School took on a new dimension when Congress granted it the use of the Washington Infirmary. Thus one of the earliest general teaching hospitals in the nation was established in Washington.

The distinguished history of the George Washington University School of Medicine and Health Sciences closely parallels academic advances and medical progress of the nation. The School has contributed to both.

The George Washington University Medical Center, established in 1966, consists of Walter G. Ross Hall, which houses the School of Medicine and Health Sciences; the Paul Himmelfarb Health Sciences Library; the University Hospital; the H.B. Burns Memorial Building, which houses the Medical Faculty Associates; the Helen L. and Mary E. Warwick Memorial Building; and affiliated hospitals.

In 1973, with the introduction of undergraduate programs in Allied Health Sciences, the name of the School was officially changed from the School of Medicine to the School of Medicine and Health Sciences.

Regulations

A student enrolled in the University is required to conform to the follow regulations and to comply with the rules and regulations of the college, sch or division in which he or she is registered.

A student who withdraws or is suspended, or is otherwise absent from University for one semester or more, may re-enter and continue scholastic w only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material inf mation on an application for admission, registration card, or any other Univ sity document, the student's registration may be cancelled. If such falsificati is discovered after the student has established an academic record at the U versity, the student may be subject to dismissal from the University. Such student will be ineligible (except by special action of the Faculty) for sub quent registration in the University.

Academic Dishonesty

The University community, to fulfill its purposes, must establish and mai tain guidelines of academic behavior. All members of the community are e pected to exhibit honesty and competence in their academic work. Incomin students have a special responsibility to acquaint themselves with, and make us of, all proper procedures for doing research, writing papers, and taking exam nations.

Members of the community will be presumed to be familiar with the prope academic procedures and are held responsible for applying them. Deliberat failure to act in accordance with such procedures will be considered academi dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual of fense against the community and will be prosecuted through the proper uni versity channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of Federal funds. The Univer- sity complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate; and
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certifica- tion of the student's financial dependency; and

4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

Right to Change Rules

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules and fees. Such regulations shall go into force whenever the proper authorities may determine.

Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

Student Conduct

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

University Policy on Drugs

The University cannot condone violations of law, including violation of those laws which proscribe possession, use, sale, or distribution of drugs. Members

of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

The Libraries

Students have the privilege of using the University Library and the School of Medicine and Health Sciences Library. The stacks are open, and all students are welcome to browse at their leisure. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

All students using the libraries are expected to be familiar with the regulations governing their use, which are available at each library.

Property Responsibility

The University is not responsible for the loss of personal property. A "Lost and Found" Office is maintained on campus in the Safety and Security Office.

Student Affairs

The Office of the Vice President for Student and Alumni Affairs develops student life programs, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Services, Student Activities, Student and Alumni Career Services, and Student Health Service. More detailed information on these and other activities is contained in the *Student Handbook*.

Student Health Service

The Student Health Service is an outpatient clinic located in the H. B. Burns Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practitioners, and physician's assistants who are capable of addressing most of student's medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in the College of General Studies and Continuing Engineering Education Program are not eligi-

ble. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those full-time students who do not have other coverage. Students are encouraged to carry adequate health insurance coverage for themselves and, if married, for their spouses and children. Interested students should contact the Student Health Service Office.

Residence Halls

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing may be obtained at this Office and at the Office of the Dean for Academic Affairs. Reservations for private housing must be made by students.

Guthridge Apartments

This apartment house is a University-owned, commercially operated building within the campus area. It contains efficiency and one-bedroom units which are rented only to full-time graduate students on an "as available" basis. Referrals to the resident manager of this building are made by the Director of Housing when notice is received of vacancies. Leases are executed with the management company and are on a month-to-month basis.

Housing for Undergraduate Allied Health Students

Admission to the University does not include a room reservation. The student will receive, with notification of acceptance, University residence hall information, an application for residence hall space and a declaration of intent to attend the University. The application for residence hall space must be accompanied by a $100 *nonrefundable deposit.* The housing deposit is credited toward the first semester's room charge. Rooms are leased for the academic year, September to May, and lease payment must be made in June for the fall semester. Physician assistant and nurse practitioner applicants are not encouraged to apply for University housing in view of their extended academic year.

1981–82 RESIDENCE HALL RATES PER PERSON FOR TWO SEMESTERS*

For Men:

Calhoun Hall

double room	$1,520
triple room	1,470

For Women:

Strong Hall
- single room 1,6
- double room 1,5
- triple room 1,4

For Men and Women:

Crawford Hall
- double room 1,5

Everglades Hall (limited to juniors and seniors)—
- apartment for two persons ..... 1,780 or 1,69
- apartment for three persons 1,58

Francis Scott Key Hall (limited to juniors and seniors)—
- apartment for two persons 1,69
- apartment for three persons ..... 1,690 or 1,58

Madison Hall
- double room 1,5
- triple room 1,4

Milton Hall (limited to juniors and seniors)—
- apartment for two persons ..... 1,780 or 1,69
- apartment for three persons 1,58

Mitchell Hall
- single room 1,6

Munson Hall (limited to juniors and seniors)—
- apartment for two persons ..... 1,780 or 1,69
- apartment for three persons 1,58

Thurston Hall
- double room, triple room, room for four 1,5
- suite for six 1,4

FOOD SERVICE*

Resident allied health students in the freshman and sophomore years are required to choose one of the following three food service plans: the seven-day, 19 meals per week plan, at the rate of $1,360* for the academic year; the any 14 meals per week plan for $1,310* for the academic year; or the any 10 meals per week plan at $1,250* for the academic year. Participation in the food service plan is optional for junior, senior, and graduate students, and for all students assigned to apartments. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second-floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

* Residence hall prices and allocation and food service prices are subject to change.

Veterans Benefits

The veterans counselor's office, on the third floor of Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans, active duty personnel, or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., Washington, D.C. 20421.

Facilities

Walter G. Ross Hall

Walter G. Ross Hall was dedicated and opened in 1973. This modern facility provides the teaching and laboratory facilities for students in the School of Medicine and Health Sciences. It occupies a city block on the northwest edge of the University campus; its gross area is approximately 550,000 square feet, or more than 10 acres. The building is equipped with modern audiovisual and other teaching equipment as well as basic science laboratories.

Office of Education

The Office of Education comprises a group of core facilities and services supportive of the educational, clinical, and research missions of the Medical Center. Coordinated through the Associate Dean for Education, the four divisions of the Office of Education are the Office of Audiovisual Education, the Office of Academic Computer Services, the Division for Evaluational Services, and the Paul Himmelfarb Health Sciences Library.

The Office of Audiovisual Education and Services, Frank Allen, Ph.D., Director.—This office aims to enhance learning in the Medical Center with audiovisual technology. Consultation is provided in the use of nonprint media in educational, clinical and research programs. The office provides displays of audiovisual materials and programs in classrooms, in the Audiovisual Study Center of the Himmelfarb Library and throughout the Medical Center. It has highly developed production capabilities which are available to students and faculty. They include photographic, illustration, cinematographic and television studios, and a print shop which serve the Medical Center community. Virtually all learning spaces at the Medical Center are equipped for still and motion projection and television display. Those spaces subject to frequent use are equipped with permanent systems for projection, sound amplification and recording designed to support staff and student presentations.

Office of Academic Computer Services, F. Helmuth Orthner, Ph.D., Director.—This office provides training in computer literacy and delivery of computer-based learning materials. Other services include scoring of examinations, maintenance of academic records, computing in support of research projects, data acquisition, statistical analysis and text processing. The office maintains hardware and software support for computer-based learning material developed by faculty and students of the Medical Center. It functions as an interface for the delivery of material from other computer-assisted educational programs—notably Massachusetts General Hospital and Ohio State University—through the Health Educational Network, Inc. Cooperative programs with the National Institutes of Health and the National Library of Medicine provide access to additional computerized data bases.

Division for Evaluational Services, Winfield Scott, Ph.D., Director.—The primary task of this division is to work with faculty and students toward the improvement of educational programs. It provides consultation to faculty in support of efforts to maximize opportunities for learning. It conducts evaluations of courses and other curriculum components and works toward the establishment of effective systems for evaluating student performance.

Paul Himmelfarb Health Sciences Library, Shelley Bader, M.L.S., Director.—Located adjacent to Ross Hall, the Paul Himmelfarb Health Sciences Library provides 30,000 square feet to house a capacity of 80,000 volumes. Seating is available to approximately 400 users. Space available includes smoking lounges, group study rooms, audiovisual viewing rooms, a typing room and individual study carrels. The Audiovisual Study Center is equipped with the

most recent and up-to-date resources and facilities, including videotape monitors, terminals for accessing computer-aided instructional programs, slide-tape recorders and rear-view slide projection units. The collection of more than 75,000 volumes and 1,300 journal subscriptions is enhanced by extensive nonprint audiovisual media which are both commercially and locally produced. Together these provide the foundation for the delivery of a number of special information services. The Network for Continuing Medical Education program provides loans of videotapes to individuals who cannot attend the regularly scheduled viewings. As a designated National Library of Medicine Medline Center, the library offers computer-based bibliographic research services such as Medline, Toxline and Cancerline. Staff may request monthly selective dissemination of information searches from this data base. Search capability on other data bases such as Science Citation Index, Psychological Abstracts and Biological Abstracts are being implemented. Materials not available in the collection will be borrowed to meet user needs.

Through both formal and informal means, the library staff instructs its clientele on the effective use of materials and services. An active participant in the National Library of Medicine's Regional Library Communications Network, the library is involved in regional planning and policy making.

The George Washington University Hospital

This 550-bed hospital, including the Eugene Meyer Pavilion and the Harry F. Duncan Pavilion, is adjacent to the School of Medicine and Health Sciences. It is the primary clinical teaching facility for the students and for a large house staff. It is fully approved and accredited by the American Medical Association, the American Hospital Association, the American College of Physicians, and the American College of Surgeons, through the Joint Commission for the Accreditation of Hospitals. Annual patient admissions number approximately 20,000.

The Watson Wise Emergency Pavilion of the hospital logs approximately 40,000 patient visits annually and is one of the city's most active emergency units.

The University Hospital is equipped to serve 16 specialty fields. Complex teamwork procedures such as renal dialysis, a computerized x-ray unit for diagnosing brain diseases, cardiac catheterization, open-heart surgery, transplant surgery, and total hip replacements are included in its activities. Facilities include a surgical suite of 10 rooms, two of which are equipped with overhead galleries where observers may communicate with the surgical teams, observe the electronic patient-monitoring system in action, and view the intricate surgical procedures below.

The Helen L. and Mary E. Warwick Memorial Building

This building houses a computerized multitest facility that is available to physicians for patient evaluation.

The Medical Faculty Associates

The Medical Faculty Associates are housed in the 13-story H.B. Burns Memorial Building, where ambulatory care is consolidated and integrated within

the teaching program. The academic group practice of physicians in general medicine and in more than 20 specialties is based in the Burns Building. Visits of ambulatory patients number approximately 90,000 annually.

Affiliated Hospitals

Children's Hospital National Medical Center.—Children's, one of the finest pediatric health care centers in the country, houses 220 inpatient beds, including a specialized referral intensive care nursery and an adolescent unit. Its ambulatory Diagnostic and Treatment Center handles in excess of 120,000 visits a year. Children's is the major base for the School of Medicine and Health Science's Department of Child Health and Development, and for the assigned pediatric clerkship. A variety of elective opportunities are offered in various aspects of child health.

Fairfax Hospital.—This 530-bed voluntary community teaching hospital serves a burgeoning surburban area and provides all clinical services including psychiatry. Each year more than 20,600 patients are admitted, 4,900 babies delivered, 15,000 surgical operations performed, and 49,200 persons examined and treated in the Emergency Suite. Fairfax Hospital offers a rotating internship program, a School of Medical Technology, and clinical facilities for a School of Practical Nursing. Students of the School of Medicine and Health Sciences serve at this hospital in clinical clerkship and elective programs. Fairfax Hospital is an affiliated hospital for residency training in Obstetrics and Gynecology in the George Washington University Medical Center Program.

Holy Cross Hospital.—Holy Cross, a modern 338-bed hospital, is a primary clinical campus which provides students with first-hand exposure to the practice of medicine in the community. It is a private, voluntary facility in which the full range of medical, surgical, and pediatric services are provided for a growing suburban population. Last year, more than 19,000 patients were hospitalized, nearly 47,000 emergency visits were registered, and 3,263 babies were delivered at Holy Cross. The hospital, which has consistently experienced one of the highest occupancy rates in the Washington metropolitan area, is planning an expansion to include an additional 112 beds, enlarged emergency room facilities, and a new, self-contained center for in-and-out surgery.

National Naval Medical Center.—The Naval Hospital at the National Naval Medical Center, Bethesda, Md., is a 750-bed general hospital offering a wide range of specialized services, clinical research, and educational programs. Medical care is provided to active duty and retired military members and their dependents. It is a major referral center for thoracic and cardiovascular surgery as well as for cancer therapy. The teaching staff directs a complete internship and residency program in 21 specialties.

St. Elizabeths Hospital.—St. Elizabeths Hospital, established by an act of Congress in 1855, is a federal psychiatric hospital administered under the Department of Health, Education, and Welfare. This hospital provides for the treatment, care, and general well-being of approximately 6,000 patients of whom 3,400 are resident. The facility includes a completely approved General Hospital to meet the needs for medical and surgical care and functions with a full-time staff within the hospital plus attending physicians in various specialties. The hospital maintains an up-to-date medical library.

Medical students of George Washington University utilize the facilities of St. Elizabeths for clinical psychiatric training. Opportunities for research are

enhanced by a cooperative arrangement with the National Institute of Mental Health of the United States Public Health Service.

Veterans Administration Hospital.—In addition to the medical, surgical, psychiatric, neurological, tubercular, and physical medicine and rehabilitation services, this 700-bed hospital has a large outpatient program; an extensive medical research program; programs in open heart surgery, cobalt therapy, and renal dialysis; a metabolic program; and a specially designed Administrative Research Laboratory.

Washington Hospital Center.—This 843-bed private, voluntary institution serves the greater Washington area through a triad of activities: patient care, teaching, and research. The Center is the tenth busiest of more than 7,000 hospitals in the United States and the second busiest private hospital in terms of inpatient admissions. A very active emergency service cares for more than 49,000 patients a year, and the 50 clinics provide all major clinical service except pediatrics for about 65,400 outpatients and 31,700 inpatients yearly. In addition to an extensive approved internship and residency program, the Center offers organized instruction for nurses, laboratory and x-ray technicians, medical secretaries, and other health-related vocations.

Committees 1980–81

ACADEMIC FREEDOM AND ETHICS

B.W. Smith *(Chairman)*, B. Arling, A. Baer, V.H. Cohn, H.L. Feffer, H.C. Pierpont, P.F. Teychenne

ADMISSIONS AND ADVANCED STANDING

P. Cohen *(Chairman)*, C.J. Bier, L.T. Bowles *(ex officio)*, J.H. Egan, J.B. Erdmann, M.P. Footer, P.L. Gross, R.I. Keimowitz, S.M. Kirson, F.N. Miller, Jr., G.C. Rosenquist, R. Scalettar, G.V. Stokes, M.E. Tidball

ALLIED HEALTH PROGRAMS

J.E. Ott *(Chairman)*, J.A. Becker, P.S. Birnbaum, L.T. Bowles *(ex officio)*, C.A. DeAtley, J.K. Johnson, T.N. Johnson, P. Klubes, S. Silver, P.E. Shorb, Jr., D.W. Watkins, J.M. Wise

APPOINTMENTS, PROMOTION AND TENURE

J.M. Wiener *(Chairman)*, L.F. Affronti, H.L. Feffer, M.J. Jackson, L.S. Lessin, W.P. McKelway, S.A. Shelburne, Jr.

BYLAWS

M.L. Elgart *(Chairman)*, L. Cytryn, L.H. Fenton, H.C. Pierpont *(ex officio)*, W.S. Yamamoto, J.S. Zacharia

COMMUNICATIONS AND EDUCATIONAL RESOURCES

H.C. Miller, Jr. *(Chairman)*, F.D. Allan, L.T. Bowles *(ex officio)*, M.D. Delaney, D.W. Dew, F.J. Kavanaugh, J.M. Kerns, H.F. Orthner, W.H. Scott, M.J. Shaffer, L.W. Thompson

CONTINUING MEDICAL EDUCATION

J.M. Giordana *(Chairman)*, H.H. Ammerman, J.K. Barber, D.W. Delaney, M.D. Delaney, B.S. Dunbar, R.N. Edelson, C.T. Garrett, J.K. Johnson, W.M. Lukash, A.M. Mondzac, D.S. O'Leary *(ex officio)*, T.E. Piemme, C.B. Robinowitz, R.J. Van Houten, L.M. Weiss

EDUCATIONAL EVALUATION

J.C. Rios *(Chairman)*, L.F. Affronti, B.C. Blatt, L.T. Bowles *(ex officio)*, B.L. Frankel, B.J. Gaffney, L.L. Gallo, J.M. Giordano, F.C. Green, M.J. Jackson, R.I. Keimowitz, S.M. Knoll, A.M. Kwart, J.W. Larsen, Jr., J.J. Rheingold, J.M. Rosenstein, W.H. Scott, H. Sidransky, O.L. Silva, J.A. Straw, C.W. Thompson, R.S. Wilkinson, A.C. Wyman

EDUCATIONAL PLANNING

W.W. Olmsted *(Chairman)*, L.T. Bowles *(ex officio)*, O.W. Donnelly, I. Dosovitz, L.W. Greenberg, K.Y. Huang, S.A. Karmi, R.J. Katz, R.I. Keimowitz, J.C. LaRosa, R.A. Lavine, H.G. Mandel, J.M. Orenstein, L.G. Pawlson, W.H. Scott, R.S. Snell, P.F. Teychenne, A.M.S. Thompson, H.H. Trout III, G.A. Walker, B. Waxman

EXECUTIVE COMMITTEE OF THE MEDICAL CENTER FACULTY SENATE

R.A. Kenney *(Chairman)*, P.S. Birnbaum, R.N. Edelson, R.P. Kaufman *(ex officio)*, J.C. Rios, N.T. Tsangaris, J.M. Wiener

GRADUATE MEDICAL EDUCATION

S. Perlin *(Chairman)*, M.F. Armaly, A.H. Einhorn, M.L. Elgart, S. Fabro, R.I. Keimowitz, S.G. Kent, A.I. Kobrine, J.C. LaRosa, H.C. Miller, Jr., G.F. Molinari, R.J. Neviaser, D.S. O'Leary *(ex officio)*, W.W. Olmsted, W.H. Scott, P.E. Shorb, A. Stone, R.J. Van Houten

LONG RANGE PLANNING

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MEDICAL SCIENCES GRADUATE PROGRAMS

J.W. Millar *(Chairman)*, K. Huang, K.E. Johnson, J.K. Kelleher, P. Klubes, W.J. Rzeszotarski, G.V. Vahouny, B.C. Zook

PUBLIC RELATIONS

A.I. Kobrine *(Chairman)*, P.S. Birnbaum *(ex officio)*, M.P. Footer, P.L. Gross, R.J. Lewis, G.B. Thurman

RESEARCH

A.L. Goldstein *(Chairman)*, J.M. Bailey, L.T. Bowles *(ex officio)*, M.M. Cassidy, J.D. Finkelstein, C.T. Garrett, G.W. Geelhoed, A.N. Gulati, K.E. Johnson, P.D. Kind, N.C. Kramer, F. Leonard, P. Mazel, G.F. Molinari, T.E. Morgan, R.K. Riegelman, A.M. Ross, S.M. Sotsky, R.J. Stillman, B.C. Zook

SPACE AND FACILITIES

M.F. Armaly *(Chairman)*, T.C. Alford, P.S. Birnbaum *(ex officio)*, S. Bloom, L.T. Bowles *(ex officio)*, E.W. Bradley, V.H. Cohn, Jr., J.B. Craft, Jr., S.E. Fabro, R.I. Keimowitz, F. Leonard, R.A. Muesing, M. Reich, F.J. Slaby, B.W. Smith, D.W. Watkins, H.J. Zimmerman

STUDENT AFFAIRS

A. Segal *(Chairman)*, S. Alpert, J.K. Barber, B.L. Bean, L.T. Bowles *(ex officio)*, M.J. Chang, D.C.T. Choate, W.H. Cooper, P.D. Kind, D.J. Lynn, J.M. Pisani, J.G. Randolph, W.H. Scott, S. Silver, G.V. Stokes, C.S. Tidball, R.J. Walsh

Alumni and Allied Associations

THE GENERAL ALUMNI ASSOCIATION

The objectives of this association are to unite graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have matriculated in any school of the University and left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those eligible members who are current contributors (dues or otherwise) to or life members of the George Washington University General Alumni Association, the Alumni Association of any school of the University, or contributors to the Annual Support Program.

The Alumni Office is in Alumni House, 714 Twenty-first Street, N.W., Washington, D.C. 20052. All alumni are urged to keep the Alumni Office in-

formed of changes of address or occupation and to supply information wi regard to their fellow alumni.

THE GEORGE WASHINGTON UNIVERSITY MEDICAL ALUMNI ASSOCIATION

The George Washington University Medical Alumni Association, incorporate in 1959, continues the organization previously known as the George Washing ton University Medical Society.

The stated purposes of the Association are as follows: "This shall be a non profit organization international in scope, whose objectives shall be to provid constructive services for the M.D. degree alumni of the George Washington University School of Medicine and Health Sciences for furthering the art and science of medicine, research, and for the promotion of the welfare of the George Washington University School of Medicine and Health Sciences, its students, the George Washington University Hospital and its trainees."

Active membership in the Association consists of all M.D. degree graduates of the School of Medicine and Health Sciences; current members and, on appli cation, past members of the teaching staff of the School of Medicine and Health Sciences, who hold doctoral degrees; doctors of medicine who have had one or more years of postgraduate training in the George Washington University Hospital. Junior membership consists of all members of the student body of the M.D. degree program of the School of Medicine and Health Sciences.

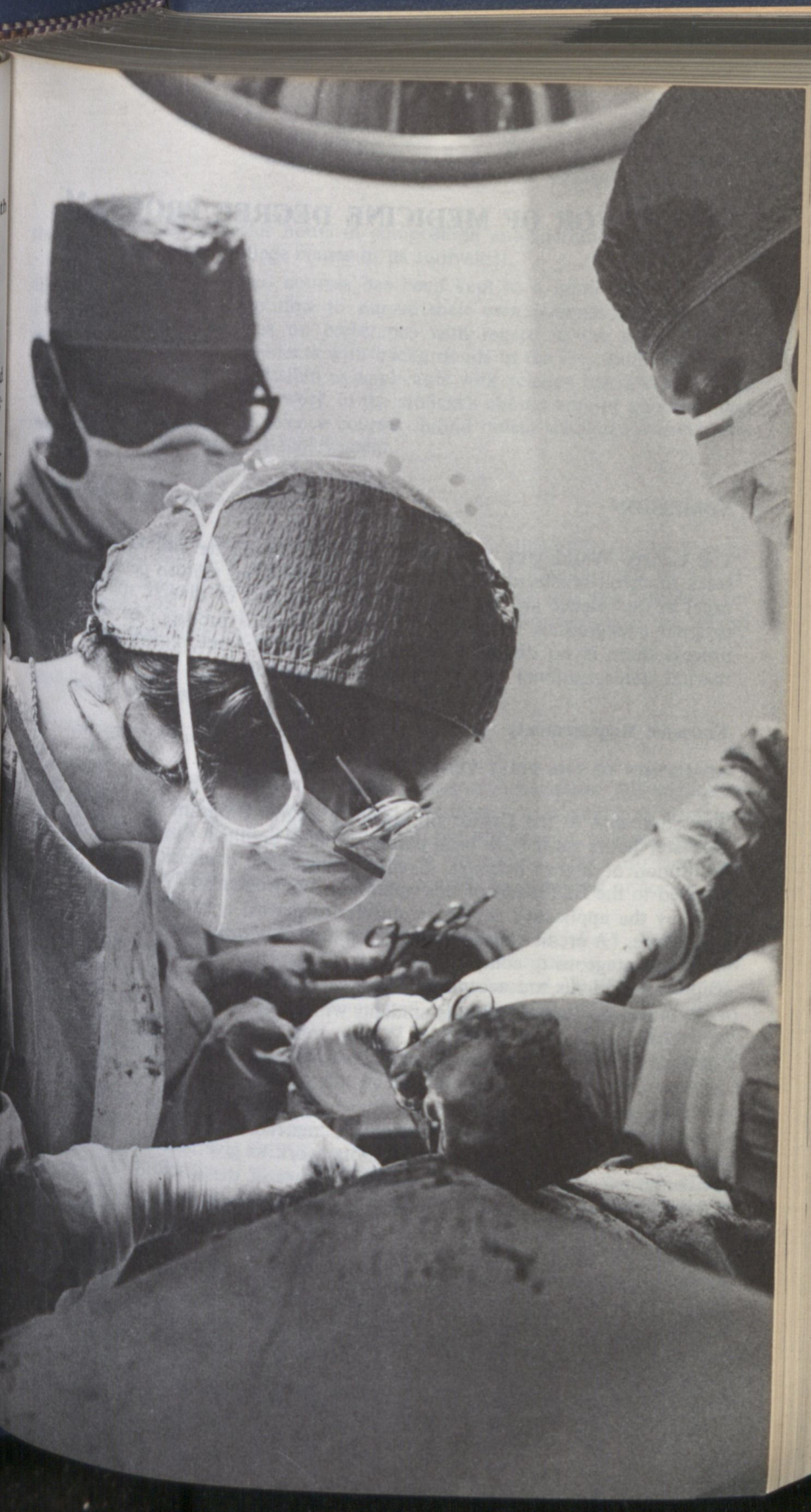
The Medical Alumni Association maintains an office in the School of Medi cine and Health Sciences.

Officers for 1980–81

President—Sidney Levine, M.D. 1941
President Elect—William Cooper, M.D. 1949
Vice President—Harry C. Beaver, M.D. 1963
Secretary—William Thompson, M.D. 1967
Treasurer—John Lyles, M.D. 1970

Council:

Brooks Brown III, M.D. 1969
Marvin Footer, M.D. 1942
John Mermel, M.D. 1960
Milton Milne, M.D. 1964
Dee R. Parkinson, M.D. 1943
Alvin Parrish, M.D. 1945
Julius Piver, M.D. 1952
William Schewe, M.D. 1943
John Umhau, M.D. 1952
Lowell Weiss, M.D. 1962
Robert K. Wineland, M.D. 1951
Allan Zellis, M.D. 1941
Paul Zimmons, M.D. 1967



THE DOCTOR OF MEDICINE DEGREE PROGRAM

ADMISSION

The George Washington University School of Medicine and Health Scienc seeks to enroll intellectually gifted, humanly sensitive, mature persons who wi excel in the science and art of medicine. Applicants of diverse social and ed cational backgrounds have access to the admissions process. In the selectio process there is no discrimination because of sex, race, color, religion, ag marital status, national or regional origin, or handicap.

Entrance Requirements

ADMISSION TO THE FIRST-YEAR CLASS

For admission to the Doctor of Medicine degree program, a minimum of 9 semester hours must have been earned in an accredited American or Canadia institution of higher learning. Credits earned in a professional school can b applied to the fulfillment of this minimum requirement only if they are accepta able by the applicant's college or university toward a bachelor's degree in arts or science. (A credit under the quarter system is two-thirds of a semester hour.) It is advantageous to complete four full years of undergraduate study. Only ex ceptional students are accepted upon completion of the minimal requirements.

It is possible for exceptional students with three years of undergraduate work in Columbian College of George Washington University to be admitted to this medical school and to receive a combined Bachelor of Arts-Doctor of Medicine degree. More detailed information on this program is given on page 31.

The following courses must be completed with satisfactory achievement be fore the applicant can be certified for matriculation. All required science courses must include sufficient laboratory work to give assurance of familiarity with the experimental methods and techniques of the disciplines.

1. **Biology:** Eight semester hours, including two semester hours of labora tory. This may be either in general biology or zoology, but may *not* include separately credited courses in botany.

2. **Chemistry:** Eight semester hours of general inorganic chemistry (which may include qualitative analysis), including two semester hours of laboratory; six to eight semester hours of organic chemistry, including laboratory.

3. **Physics:** Eight semester hours, including at least two semester hours of laboratory.

4. **English:** Six semester hours in composition and literature. This may be the usual introductory college course or its equivalent.

The number of required courses has been kept to a minimum in order to allow college students the time to pursue their own interests in depth. The Admissions Committee has no preference with regard to the major area of study of the applicant. Students with backgrounds in the arts, humanities, and social sciences are as admissible as applicants with science backgrounds. The Committee does expect that work in the student's chosen area of concentration as well as in the required science courses should reflect scholarly interests and show evidence of significant achievement.

ADMISSION WITH ADVANCED STANDING

A number of recent developments require further deliberation by the Faculty before an appropriately revised policy on advanced standing can be articulated. At the time of printing of this *Bulletin,* this review was not complete. Interested applicants are invited to write to the Office of Admissions of the School of Medicine and Health Sciences for final regulations.

Application Procedure

APPLICATION TO THE FIRST-YEAR CLASS

Application forms are available from the Office of Admissions. All applicants are reminded that the submission of materially false or misleading information in application forms or in connection with the application process shall be grounds for rejection. If such submission is discovered after entrance into the School or award of a degree, it shall be grounds for dismissal or for revocation of the degree.

The School is a participant in the American Medical College Application Service (AMCAS). Applications for a place in the first-year class can be obtained only from AMCAS, 1776 Massachusetts Avenue, N.W., Suite 301, Washington, D.C. 20036. When completed, this application is returned to AMCAS for distribution to schools selected by the applicant. The AMCAS application deadline is November 1 of the year preceding that for which admission is sought.

After receipt of our copy of the AMCAS application, the Office of Admissions will send applicants a Supplemental Application. This requests information not included on the AMCAS application. Submission of this supplemental application (due no later than December 15), including the nonrefundable supplemental application fee ($30), will initiate Admissions Committee processing of the application. On the basis of available information some applicants will be asked to have letters of evaluation (recommendation) sent. After careful review of these documents the committee will extend an invitation for interview to the most promising candidates. When these steps are completed, the application will be brought to the Admissions Committee for final decision. Applicants will be informed of final decisions immediately. Although it does not assume an obligation to report missing or erroneous credentials, the Admissions Office will try to contact the applicant if it is noted that necessary credentials are missing.

This institution also participates in the AMCAS Early Decision Program. Interested applicants are referred to the AMCAS Information Booklet included with the AMCAS application materials. Early decision applicants should be aware that they must submit their application by August of the year preceding that for which admission is sought, and that for consideration, the supplemental application and all letters of recommendation and transcripts must be received by the Office of Admissions no later than September 1. Decisions on early decision candidates are made usually by October 1 and no later than October 15.

Applicants are referred to the AMCAS information booklet and to the admissions brochure available from the Office of Admissions, School of Medicine and Health Sciences, for the most up-to-date information available at the time of application. Details included in those sources supersede information contained herein.

APPLICATION WITH ADVANCED STANDING

Information and applications for admission with advanced standing should be obtained from the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, 2300 Eye Street, N.W., Washington, D.C. 20037.

All applicants must complete an advanced standing application form and submit it with a $30 application fee no later than June 1.

Selection Procedures

To process the vast number of applications to this institution fairly and expeditiously, a screening evaluation system is utilized. This evaluation procedure screens applicants on the basis of undergraduate grades (taking into account improvement in performance in later years), Medical College Admission Test scores, and pertinent extracurricular and work experiences. Some additional consideration is given to applicants from the District of Columbia and the neighboring metropolitan area, as well as to applicants from George Washington University. There are no age limits.

When all credentials and interview reports are available, the application is reviewed by the Admissions Committee. In this review, although grades and MCAT scores are considered, major consideration is given to the essay portions of the applications, the letters of evaluation, and the interview reports, in an attempt to assess those motivational and personal characteristics that the committee feels are important in choosing future physicians.

Applicants who are offered a place in the class are required, within two weeks, to notify the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, in writing, of their intent to accept the places reserved for them. A deposit of $100 is also required by a specific date after notification of acceptance. The date will be given in the notice of acceptance. The deposit becomes nonrefundable two weeks prior to registration but will be credited toward the first semester's tuition.

PROGRAM OF STUDY

The faculty and administration of the School of Medicine and Health Sciences have developed a curriculum designed to prepare each student for a

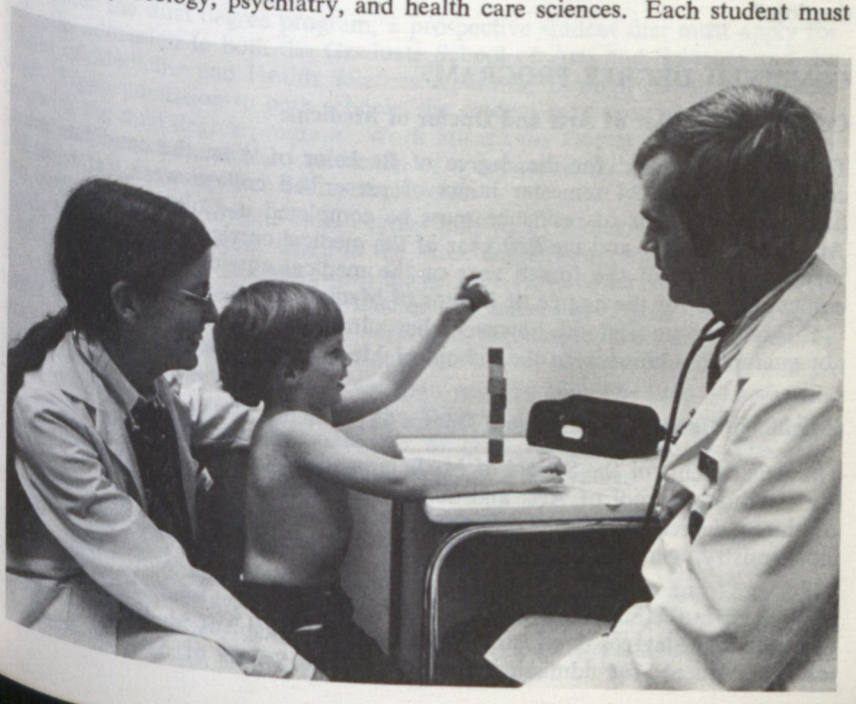
professional life of continuous learning. Because students differ in background, ability, and career interests, the curriculum is balanced with required courses, and students are encouraged to maximize achievement within their own limits. It is presumed that all graduates will seek additional education in graduate training programs before assuming complete responsibility for independent clinical decision-making.

In the first year, the student concentrates primarily on basic sciences. The course of study includes anatomy and biochemestry in the first semester. In the second semester, the student concentrates on physiology and microbiology in addition to an integrated course in neurobiology.

Freshman and sophomore medical students are permitted to register for electives for credit or use elective time at their discretion. The first two weeks of an elective are probationary, to enable students to decide whether it is suited to their needs. After completing the first two weeks of an elective, students are committed to complete the course requirements.

The second year integrates basic science and clinical information. Pathology and pharmacology provide the major basic science substrates. This academic program has been evolving since 1970 and several innovations have been introduced each year. The course is coordinated by a program director. Integration is accomplished through the work of faculty subcommittees working with the program director and the second-year subcommittee on educational planning. Medical students are introduced to physical diagnosis during the first semester of the second year.

The final two years form a two-year continuum of required clerkships and elective sequences, designed to bring the student to optimal readiness for graduate training. Clerkships are required in medicine, surgery, pediatrics, obstetrics-gynecology, psychiatry, and health care sciences. Each student must



complete a 4-week acting internship in one of the following: medicine, pediatrics, or family medicine. In addition, each student must take a 2-week clerkship in anesthesia and *two* 2-week clerkships from among the following: orthopaedics, urology, neurosurgery, or plastic surgery.

A variety of elective experience is available at the University and its affiliated hospitals; permission may be granted to take electives elsewhere.

During the entire educational experience, students are encouraged to assume responsibility for their self-assessment and continued learning. It is the goal of the faculty to select and educate concerned human beings who will function productively and effectively during a long career in medicine.

DEGREE REQUIREMENTS

Every candidate for graduation with the degree of Doctor of Medicine must have satisfactorily completed the requirements of the School of Medicine and Health Sciences as described above, including no less than four academic years of study as a matriculated student in medicine or the equivalent. All required courses must be completed and all prescribed examinations satisfactorily passed.

HONORS

Candidates who have completed the four-year course for the Doctor of Medicine degree and have received the grade of *H* (Honors) in courses totalling 50 per cent or more of the total number of semester hours taken may be recommended by the Executive Committee of the Medical Center for graduation "With Distinction."

COMBINED DEGREE PROGRAMS

Combined Bachelor of Arts and Doctor of Medicine

To be recommended for the degree of Bachelor of Arts, the candidate must complete at least 94 semester hours of prescribed college work (at least 30 hours and one year of residence must be completed in Columbian College of Arts and Sciences) and the first year of the medical curriculum. Upon satisfactory completion of the fourth year of the medical curriculum the student becomes eligible for the degree of Doctor of Medicine.

It should be understood, however, that admission to Columbian College does not guarantee admission to the School of Medicine and Health Sciences.

Combined Master of Science and Doctor of Medicine

The departments of the School of Medicine and Health Sciences cooperate with the Graduate School of Arts and Sciences in offering programs leading to the combined degrees of Master of Science and Doctor of Medicine in the fields of biochemistry, genetics, microbiology, mycology, pharmacology, and physiology.

Students in the School of Medicine and Health Sciences who wish to apply for the combined degrees of Master of Science and Doctor of Medicine must meet the requirements for admission to the Graduate School of Arts and Sciences.

They must be recommended by the chairman of the department and by the Dean of the Graduate School of Arts and Sciences and the Dean for Academic Affairs of the Medical Center.

The Master of Science degree program consists of a minimum of 30 semester hours which includes a thesis (equivalent to six semester hours). For a Master of Science degree program which does *not* include a thesis, the number of semester hours of graduate course work is determined by the department. The program without the thesis is not an individual student option and is not available in every department.

A maximum of 12 semester hours of credit for graduate-level courses *completed as a part of the Doctor of Medicine degree* (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining semester hours of work, including a thesis if it is required, must be in course work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

Dual Program for the Doctor of Medicine and Doctor of Philosophy Degrees

In cooperation with the Graduate School of Arts and Sciences a dual program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements which must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

To enter the dual degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. Upon admission to both schools, the student may then apply for affiliation with the dual degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a *departmental* doctoral committee and is available in more than 50 research fields.

A student working toward these degrees may apply a maximum of 24 semester hours of approved work taken in the M.D. degree program of the School of Medicine and Health Sciences toward the total of 72 semester hours required to complete the requirements for the Doctor of Philosophy degree. Twenty-four hours of this requirement must be earned in graduate courses during periods when the student is not obligated to full-time enrollment in the M.D. degree program, i.e., during summer sessions, vacation periods, etc. The final 24 semester hours of dissertation research toward the Doctor of Philosophy degree may begin concurrently with the final semester of graduate course work. The estimated time for completion of this dual program is six years.

Master of Science and Doctor of Philosophy Requirements

The detailed requirements for the degrees of Master of Science and Doctor of Philosophy are stated in the *Undergraduate and Graduate Bulletin* of the University, which is available at the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

REGULATIONS FOR M.D. CANDIDATES

Attendance

A student is not permitted to attend classes until registration has been com pleted and fees due have been paid. Regular attendance is required.

Grades

H (Honors); *P* (Pass); *F* (Fail); *CN* (Conditional); *IP* (In Progress); *I* (In complete); *W* (Withdrawal); *X* (Exempt).

H (Honors).—Those students whose performance in a subject as determined by the department concerned is of a very high caliber, and who, *in addition* have demonstrated those qualities of intellectual curiosity, integrity, and self- discipline which clearly set them apart from the majority of the group, may be assigned the grade of *H* (Honors).

P (Pass).—All students, with the exception of those specifically defined above, whose performance in a subject meets the minimum requirements established by the department concerned, shall be assigned a grade of *P* (Pass).

F (Fail).—Those students whose performance in a subject as determined by the department concerned is of such a low caliber that a satisfactory level of performance could not reasonably be expected to be attained by a program of guided study developed by the department shall be given a grade of *F* (Fail).

A grade of *F* requires that the student repeat the course at this or some other institution approved by the department and the Dean for Academic Affairs prior to proceeding to the work of the following year. Upon comple- tion of such a course with a grade of *P* (Pass) or its equivalent, the student shall be permitted to continue in the M.D. program and the grade of *F* con- verted to *F/P*.

CN (Conditional).—Those students who do not meet the minimum require- ments established by the department concerned but who could reasonably be expected to do so through a program of remedial work to be developed by the department and approved by the Committee on Educational Evaluation, shall be assigned the grade of *CN* (Conditional). The grade of *CN* is not a passing grade and must be upgraded prior to beginning the next academic year or, in the case of clinical subjects, prior to graduation. Upon certifica- tion by the department that the student has attained suitable proficiency in the subject, as evidenced by examination or such other criteria as may be appropriate, the student shall be permitted to continue in the M.D. program and the grade of *CN* converted to *CN/P*.

A student may, in lieu of such a program, elect to repeat the course at this or any other institution which is approved by the department concerned. A grade of *P* (Pass) or better shall then result in conversion of the *CN* to *CN/P*.

Failure to upgrade a *CN* to *CN/P* by one of these procedures within the prescribed period shall result in the automatic conversion of the *CN* to *CN/F*.

IP (In Progress).—The grade of *IP* will be assigned to students in courses which require more than one semester for completion. A grade will be as- signed upon completion of the entire course in a subsequent semester.

I (Incomplete).—The grade of *I* will be assigned when a student fails to com-

plete all the required work in a course for reasons acceptable to the Dean for Academic Affairs. A student in the first or second year may not proceed into the work of the following year until a grade of *I* has been removed; if not removed, a grade of *I* will be changed automatically to a grade of *F* (Fail) after one year. A student in the third or fourth year must remove a grade of *I* prior to graduation.

W (Withdrawal).—The grade of *W* will be assigned only when a student is unable to continue in school for reasons acceptable to the Dean for Academic Affairs. Such reasons may *not* include scholarship. The student may be readmitted at the discretion of the Dean for Academic Affairs, within a period of two years, and may repeat for credit the course or courses in which the grade of *W* had been assigned.

X (Exempt).—The grade of *X* is an administrative grade issued by the department to students "exempt" from a required course; it is awarded on the basis of previous work taken or a waiver examination.

Grading of First- and Second-Year Electives

The first two weeks of an elective in the first and second year are probationary to enable students to decide whether it is suited to their needs. After completing the first two weeks of an elective, the student is committed to complete the course requirements and each elective shall be graded on a Pass/Fail system with the grade *P* or *F* recorded on the student's transcript. Distinguished performance should be recognized by sending a letter to the Dean for incorporation into the student's file.

Definition of Good Academic Standing

A student is considered in good academic standing until such time that he or she is formally dismissed from the Doctor of Medicine degree program. In other words, for those programs that require a statement of good academic standing from the institution, such a statement will be forthcoming on any student unless he or she is formally dismissed from the Doctor of Medicine degree program of the School of Medicine and Health Sciences.

Academic Probation and Academic Dismissal

On recommendation of the Educational Evaluation Committee, the Dean for Academic Affairs may place a student on academic probation or dismiss him or her from the M.D. program. The Educational Evaluation Committee shall make its recommendations after careful and individual review considering the total number of credit hours of *CN* and *F* grades in required courses and required elective courses attained by the student during the M.D. program, without regard to whether these grades have been upgraded by further study; except that in the case of a student who has been permitted to repeat a year, the initial grades will not be included in this total.

Academic probation and academic dismissal may be recommended by the Educational Evaluation Committee under the conditions described below.

Academic Probation.—A student who receives grades of *F* in courses totalling six or more semester hours, or a combination of grades of *F* and *CN* in

more than six semester hours in one semester, shall be placed on academ probation for the following semester. A student who, while on probation, r ceives a grade of *F* or *CN* in any course will be continued on probation f the following semester. A student who, through action of the Educatio Evaluation Committee and the Dean for Academic Affairs, has been pe mitted to repeat a year shall be placed on academic probation. All studen on academic probation shall be reviewed by the Educational Evaluation Com mittee at the end of their probational periods.

Academic Dismissal.—A student (1) who is on academic probation for fou or more semesters, consecutive or otherwise; or (2) who receives grades of *F* in courses totalling 14 or more semester hours in any academic year; or (3) who receives grades of *CN* or *CN* and *F* combined in courses totalling more than 20 semester hours of work in any academic year; or (4) who receives grades of *F* in more than 20 semester hours of work in the M.D. program or (5) who receives grades of *CN* or *CN* and *F* combined totalling more than 30 semester hours of work in the M.D. program; or (6) whose knowledge and clinical competencies have not achieved, in the judgment of the Educational Evaluation Committee, a satisfactory level of development and integration at any stage of training to justify continuing him or her as a reasonable candidate for the M.D. degree will be subject to dismissal from the M.D. degree program. (See also section on Evaluation of Non-Academic Competence.)

Evaluation of Non-Academic Competence

To assure the safety of the public, the institution reserves the right to dismiss from the M.D. program any student whose behavior is clearly unacceptable for or would be dangerous in the practice of medicine. Since it would be impossible to catalogue all behaviors which might raise serious question as to the student's competence to continue in medical school, a process has been established to deal with problems in this domain. Safeguards have been taken to prevent this from becoming a mechanism to discourage deviation from social norms, or to suppress personal or political expression. It is carefully designed to protect any student from discrimination on the basis of his or her beliefs or personal behavior where these are not likely to be dangerous to the public should the student become a physician.

Upon receipt of a written complaint about a student, the Dean for Student Affairs would inform the student and conduct a confidential inquiry. Possible dispositions would be to advise the student, to drop the matter entirely, or to refer it on to a subcommittee of the Educational Evaluation Committee. Two of the subcommittee's four members would be medical students. The subcommittee's proceedings would also be confidential, and would result in advising the student, dropping the matter or referring it on to the Educational Evaluation Committee. Its recommendations might be to discontinue the inquiry, to place the student on probationary status (which would be carefully defined), or to dismiss the student from the M.D. program. At every stage, the student would have the right of appeal.

Any interested person may receive a copy of the complete regulations for students in the M.D. program from the Admissions Office or from the Office of the Dean for Academic Affairs.

Examinations

Examinations, which may be written, oral, or practical, will be held during and/or at the end of each semester.

Graduation

Graduation follows satisfactory completion of the course of study, and does not imply the acquisition of a set number of credit hours.

Application for Graduation.—Application for graduation must be filed in the Office of the Dean for Academic Affairs, and the fee must be paid at the time of registration for the last semester of the fourth year.

Presence at Graduation.—A candidate is required to be present at the graduation exercises unless written application for graduation *in absentia* is approved by the Dean for Academic Affairs.

FEES AND FINANCIAL REGULATIONS FOR M.D. CANDIDATES

The following fees have been established for the 1981–82 academic year.*

Application fee	$30.00
Tuition fee, for the academic year	15,000.00
University Center fee, charged all students (except those granted "leave of absence" status) each semester	55.50
Late registration fee, for failure to register within the designated period	15.00
Late payment fee, charged for failure to make payments when due (see "Payment of Fees," below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," below)	35.00
Graduation fee	25.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for insufficient funds or for any other reason	15.00
Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each, fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Payment of Fees

The annual tuition fee for the academic year is payable in two equal installments on or before registration day for each semester. M.D. students who register during the summer for courses offered in other divisions of the University will be charged the regular summer tuition and other fees. No tuition will be charged M.D. students for Medical School clerkships elected by the student during the summer between the second and third years. No additional tuition will be charged third year students for courses taken anywhere in the University during the summer prior to registration as a fourth year student. No student is permitted to complete registration or attend classes until all charges are

* For courses offered in other divisions of the University, the following 1981 Summer Sessions fees apply for each semester hour: Tuition $134.00; University Center fee, $5.25.

paid. Tuition and fees are payable at the Office of the Cashier of the Univer sity. Checks should be made payable to George Washington University, wi student indentification number shown in upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintainin student accounts for tuition, various fees, and room and board charges. Whi tuition is due and payable in full as described above, students may sign deferred payment contract with the Student Accounts Office at the time o registration permitting them to pay one-half of the total tuition and fees (ex cept for fees payable in advance) at the time of registration and the remainin half on or before Wednesday of the eighth week of classes for the fall an spring semesters. Interest at the rate of eight per cent per annum on the unpai balance will be charged from the date of registration to the date payment i made.

Students receiving tuition assistance in the form of scholarships, govern ment tuition contracts, or other forms of tuition awards are not permitted t sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more per semester. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late payment fee and will be subject to the interest charge of eight per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encum bered, the student forfeits rights to the use of the deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settle ment will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

After entering the course of instruction the student is obligated for the tuition for the full semester. A student registered for medical electives in the summer session between the second and third year is obligated for tuition due at the time of registration for the following fall semester, except that in the case of withdrawal or leave of absence a *pro rata* payment will become due immediately.

Acceptance by the University of a student's fees does not in any way obli gate the School of Medicine and Health Sciences to accept the student for any subsequent semester or summer session, and the right is reserved to require the withdrawal of any student whenever, in the interest of the student or the School, the Executive Committee of the Medical Center deems it advisable to do so.

Cost of Textbooks and Student Equipment

It is estimated that the minimum cost of necessary textbooks and student equip ment (microscope, drawing materials, glass slides, clinical thermometer, stetho scope, hemocytometer, uniforms, etc.) is approximately as follows: first year, $800; second year, $950; third year, $350; and fourth year, $200. Microscopes must be provided by the student. Rentals are not available from the School.

Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Street, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

Complete withdrawal from the University:

Withdrawal dated on or before Saturday of the first week of classes 90%
Withdrawal dated on or before Saturday of the third week of classes 75%
Withdrawal dated on or before Saturday of the fifth week of classes 50%
Withdrawal dated after the fifth week of classes .....none

Regulations governing student withdrawals as they relate to apartment and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

FINANCIAL AID

The following fellowships, scholarships, and loan funds are available to students in the School of Medicine and Health Sciences. Unless otherwise specified, inquiries should be directed to the Financial Aid Office of the Medical Center, George Washington University, 2300 Eye Street, N.W., Washington, D.C. 20037.

Fellowships

Wilbur J. and Edith K. Carr Memorial Fellowship Fund (1965).—By bequest of Edith K. Carr, former trustee of the University. The income from this fund provides fellowships in surgery, medicine, or medical research at the George Washington University Hospital.

Samuel Jordan Graham Fellowship in Surgery (1961).—By bequest, in memory of Judge and Mrs. Graham. The income from this fund, up to $2,000, may be used to assist students who are pursuing postgraduate study or research, preferably in surgery, at the School of Medicine and Health Sciences.

If no individual is conducting such work or deserving of the award, the income may be used to provide one or more scholarships (to cover tuition and other school expenses deemed appropriate) for students in the School of Medicine and Health Sciences. Application should be filed with the Chairman of the Department of Surgery no later than March 1.

Robin Miller Research Fellowship (1953).—A $3,000 fellowship established by bequest of Mrs. Robin Miller for the study of cardiovascular diseases.

Henry Rau Foundation Student Fellowship Grant (1967).—Awarded annually to a student in the School of Medicine and Health Sciences for research in cancer and allied diseases at the George Washington University Clinic.

U.S. Public Health Service Training Grants.—Information concerning training grants in fields of the medical sciences is available at the Office of the Dean for Academic Affairs of the Medical Center.

Scholarships

Scholarships from University funds are offered to full-time students in the M.D. program on the basis of financial need and scholastic achievement. These awards are made for one academic year at a time and are credited directly to the student's tuition bill. Application forms are available upon request from the Financial Aid Office. The deadline for submission is March 15.

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship.—Awarded to a student on the basis of financial need and superior grades. Candidates must be citizens of the United States.

Anna Bartsch Hospital Intern Scholarship (1946).—A partial scholarship established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman intern in the University Hospital.

Dr. Edith SeVille Coale Scholarships (1965).—Provided at the request of Dr. Coale for women in the School of Medicine and Health Sciences. The scholarships are administered by the Zonta Club of Washington. Application should be made to the Financial Aid Office of the Medical Center no later than December 1.

Joseph Collins Foundation Scholarships (1951).—Available to medical students upon application through the Financial Aid Office of the Medical Center.

Morris H. and Pauline L. Goldenberg Scholarship Fund (1979).—Created by gift of Dr. Morris H. (class of 1929) and Mrs. Pauline L. Goldenberg in memoriam for father and mother, the income from which will be used for needy and deserving medical students in the School of Medicine and Health Sciences. Preference will be given to students expressing an interest in the study of radiology.

The Garfield Kass Memorial Medical Scholarship (1979).—Established by his wife Rose. Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

Ki-Wives of Washington Scholarship Fund (1958).—Three scholarships available to students in the School of Medicine and Health Sciences.

Sidney A. Levine Scholarship Fund (1971).—Established to assist medical students on the basis of financial need and academic performance.

Medical Student Research Scholarships and Traineeships.—For student participation in the research programs of the School of Medicine and Health Sciences or special training in research methods. Research scholarships are ordinarily awarded for full-time activity during the summer months; research traineeships support part-time work during the academic year. Scholars are "matched" with members of the faculty in accordance with their mutual interests. Trainees are designated by the departments responsible for the programs. These programs have been sponsored by the National Institutes of Health. In addition a number of research scholarships have been made available through the Washington Heart Association.

Thomas M. Peery Scholarship (1974).—Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

Dan Pollin Medical Scholarship Fund (1980).—Awarded on the basis of financial need to a worthy student in the School of Medicine and Health Sciences.

School of Medicine Scholarship Fund (1968).—Established by gifts of various and anonymous donors to assist medical students.

Gordon Fay Willey Scholarship (1974).—Awarded to students whose parents are U.S. citizens who are or were enlisted men, non-commissioned officers and officers below the grade of Major in the Army or Air Force or Captain in the Navy of the United States.

Winslow Foundation Scholarship (1974).—Available to medical students who are residents of Maryland, the District of Columbia, or North Carolina, on the basis of financial need.

School of Medicine and Health Sciences Scholarship Fund

Scholarship aid is awarded from income on endowments that have been established by gifts from various donors for tuition awards to students in the School of Medicine and Health Sciences. Listed below are the endowments that support the School of Medicine Scholarship Fund:

Anna Bartsch Scholarship Fund (1946).—Established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman in the School of Medicine and Health Sciences "of outstanding scholarship, character, and promise, who intends to make the practice of medicine her life profession."

Jack I. Bender Scholarship Fund (1967).—Established by the family of Jack I. Bender as a memorial to their father. Awarded annually to a student on the basis of academic performance and financial need.

Everett Lamont Bradley Scholarship Fund (1954).—By bequest of Alice R.H. Bradley in memory of her son, for a student in the School of Medicine and Health Sciences.

Elma B. Carr Scholarship Fund (1976).—Created from income distributi of the Elma B. Carr, M.D. Trust, the income to be used for scholarships the School of Medicine and Health Sciences.

Oliver C. Cox Scholarship Fund (1973).—Established in memory of D Oliver C. Cox, "for the establishment, support and maintenance of endow scholarships in medicine."

Barbara Logan, M.D. Scholarship Fund (1980).—Awarded annually to th third-year student who ranked among the top five students in the class durin the first two years and who was experiencing the greatest financial need amon those five.

Loughran Medical Scholarship (1976).—A partial scholarship established b the Mary and Daniel Loughran Foundation, Inc., for residents of the Wash ington metropolitan area. Such residency must have been established prior t the commencement of the recipient's undergraduate studies. Awarded 1978–7 and every third year thereafter.

David Perry Steinman Memorial Scholarship Fund (1960).—Established by friends and classmates. Awarded annually to a second-year student in the School of Medicine and Health Sciences on the basis of financial need and aca demic performance.

James J. Whisman Scholarship Fund (1966).—By bequest of James J. Whis man for needy and deserving students in the School of Medicine and Health Sciences.

Columbian Women Scholarship Funds

The Columbian Women Scholarships are awarded to women students on the basis of financial need and scholastic attainment. Candidates must have com pleted a minimum of 15 hours at this University with a minimum *B* (3.0) average, or the equivalent. A letter of application for these scholarships should be addressed to the Chairman, Columbian Women Scholarships, care of the Alumni Office, George Washington University, Washington, D.C. 20052, no later than May 15 for the fall semester, and January 1 for the spring semester. Scholarship aid is awarded from income of the following endowments:

Estelle M. Corbett Scholarship Fund (1973).—Created by gift of Elma Williams for tuition aid for a medical student.

Jessie Fant Evans Scholarship Fund (1967).—Established by bequest of Jessie Fant Evans, former Trustee of the University, for tuition aid.

Lewes D. and Myrtle H. Wilson Memorial Scholarship Fund (1926).—Es tablished by Elizabeth Wilson, as a memorial to her parents, for tuition aid.

Loan Funds*

A.M.A. Medical School Loan Fund.—Created in 1964 by the American Medical Association, to be loaned to students.

Doreen and Donald Brown Loan Fund.—This fund has been established to provide aid to worthy and needy medical students.

Morris and Gwendolyn Cafritz Foundation Loan Fund for Medical Students. —Created in 1977 by the Morris and Gwendolyn Cafritz Foundation, to be loaned to students.

* See the George Washington University School of Medicine and Health Sciences *Financial Aid Handbook* for more complete information.

Carr Loan Fund.—Created in 1962 by Edith K. Carr, to be loaned to students.

Abraham I. Gimble Medical School Loan Fund.—Created in 1977 by gift of Dr. Abraham I. Gimble, to be loaned to deserving and needy students.

Katharine Graham Medical School Loan Fund.—Created in 1978 by gift of Katharine Graham, to be loaned to deserving and needy students.

Himes Loan Fund.—Created in 1957 by Joseph H. Himes.

Kellogg Medical School Loan Fund.—Created in 1942 by the W.K. Kellogg Foundation, to be loaned to students.

Dr. Esther A. Nathanson Memorial Medical Loan Fund.—Created in 1977 in memory of Esther A. Nathanson, A.B. 1922, M.D. 1925, by her sister, Sadie C. Nathanson, to be loaned to deserving and needy students.

Pfizer Loan Fund.—Created in 1953 by Charles Pfizer and Company, Inc., to be loaned to students.

School of Medicine Medical Student Loan Fund.—Created in 1952 by School of Medicine students, and augmented by a bequest from the estate of Ethel L. Murray to be loaned to students.

Strauss Medical School Loan Fund.—Created in 1975 by gift of Lewis H. Strauss and Mrs. Lewis L. Strauss in memory of Honorable Lewis L. Strauss, to be loaned to students.

Sutherland Loan Fund.—Created in 1941 by gift of Rose L. Sutherland and other donors.

Waller Loan Fund.—Bequest of Helen S. Waller received in 1973, to be loaned to deserving and needy students.

Janice and George Wasserman Medical Student Loan Fund.—Created in 1978 by the George Wasserman Foundation, Inc., to be loaned to deserving and needy students.

Wrather Loan Fund.—Created in 1967 by gift of Mrs. W.E. Wrather in memory of her husband, to be loaned to students.

In addition, financial assistance is available through the—

Catherine Breen Student Loan Fund (1972).—Established by alumni of the School of Medicine and Health Sciences in honor of Catherine Breen, former Assistant to the Dean of the Medical Center. Available to needy students who are candidates for the degree of Doctor of Medicine. Applications should be made to The George Washington University Medical Alumni Association.

Health Professions Student Loan Program.—This fund is available to a full-time student pursuing a course of study leading to the degree of Doctor of Medicine. Interns, residents, students engaged in premedical or other professional training, and students enrolled in programs of study other than those leading to the degree mentioned above are *not* eligible for these loans.

A candidate must (1) be a citizen of the United States or have such immigration status and personal plans as to indicate an intention to become a permanent resident of the United States, (2) be in need of the amount of the loan to be able to pursue the course of study, and (3) be in good standing with the School. Inquiries concerning deadlines and applications should be directed to the Financial Aid Office of the School of Medicine.

National Direct Student Loan Program.—This fund is available for full-time students in good standing with the school in which they are enrolled. Students must be citizens or permanent residents of the United States. All loans from the

program are made on the basis of financial need. Applications for medi students are distributed by the Financial Aid Office.

Jessie B. Martin Loan Fund (1967).—Established by friends of Jessie Martin, former Editor of Academic Publications at the University. An emergency fund for loans up to $200, repayable in 30-60 days, with interest rate 3 per cent per annum. Application should be made to the Director of t Office of Student Financial Aid of the University.

PRIZES

Janet M. Glasgow Award of Outstanding Achievement, American Medica Women's Association, Inc.—Awarded annually if the student standing first i the graduating class is a woman.

American Medical Women's Association, Inc. Scholarship Achievement Citation.—Awarded annually to those female students who are considered "honor graduates" when ranked against all other students in the graduating class.

Samuel M. and Miriam S. Dodek Prize (1967).—Established in memory o Professor Bernhard Zondek, the eminent discoverer of the endocrinology of the human female reproductive cycle. Awarded annually to a member of the graduating class who has attained a commendable knowledge and understanding of the field of female endocrinology.

Allie S. Freed Prize (1957).—Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of preventive medicine.

Walter Freeman Prize (1966).—Awarded annually to a student in the graduating class who submits the best essay based on original investigation.

Alec Horwitz Prize (1959).—Awarded annually to a senior who has demonstrated exceptional proficiency in the field of surgery.

Oscar Benwood Hunter Prize (1952).—Established by The George Washington University Medical Society, now known as The George Washington University Medical Alumni Association. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pathology.

Jacobi Medical Society Prize (1962).—Established in memory of Dr. Abraham Jacobi, the founder of pediatrics practice in the United States. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pediatrics.

Howard Kane-A.F.A. King Obstetrical Society Prize (1937).—Established in memory of Dr. Howard Kane and Dr. A.F.A. King, who served as Professors in the School of Medicine and Health Sciences. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in obstetrics and gynecology.

Dr. Harold Lamport Biomedical Research Prize.—Established by the Lamport Foundation in memory of the late, distinguished physiologist, Dr. Harold Lamport, awarded annually to the student writing the best paper on original laboratory investigation in physiology.

Lange Medical Publications Prize.—Awarded annually to two members of the graduating class who are considered outstanding. The prize consists of the graduate's choice of four books published by Lange Medical Publications.

Huran W. Lawson Prize (1957).—Established by Mrs. Lawson in memory of her husband, who was a distinguished member of the Medical Staff of the Uni-

versity, presented annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of obstetrics and gynecology.

Benjamin Manchester Prize (1966).—Established by a grateful patient in honor of Dr. Benjamin Manchester, clinical professor of medicine. Awarded annually to a member of the graduating class who has an outstanding record and shows promise of real humanitarianism in the practice of medicine.

C.V. Mosby Book Prize.—Awarded annually to five members of the graduating class who are considered outstanding by their classmates. The prize consists of the graduate's choice of a book published by C.V. Mosby Company.

Julius S. Neviaser Prize in Orthopaedic Surgery (1956).—Awarded annually to the senior who scores the highest grade in a written examination and clinical aspects of orthopaedic surgery.

John Ordronaux Prize (1907).—By bequest, awarded annually to the member of the graduating class who has the highest scholastic standing.

William G. Schafhirt Prize (1966).—By bequest, awarded annually to a senior student for the best original essay or thesis on some medical subject of current public interest.

Upjohn Achievement Prize.—A prize and an inscribed plaque awarded annually to a member of the graduating class selected by his or her classmates on the basis of outstanding scholastic and personal achievement.

HONOR SOCIETIES

Alpha Omega Alpha.—National Honor Medical Society. Third- and fourth-year candidates for the M.D. degree meeting the qualifications specified by the constitution of the Society are eligible for election to membership.

William Beaumont Medical Society.—Medical students who have performed original research in the life sciences are eligible for membership, based upon the submission of an acceptable abstract of the research and election by society members. Outstanding students present their research findings at the annual Student Research Day. The Society also sponsors guest lectures in medical research and assists students in finding research opportunities within the Medical Center.

Howard Kane-A.F.A. King Obstetrical Society.—The 15 third- and fourth-year candidates for the M.D. degree who maintain the highest grades in their work in obstetrics are eligible for membership.

CENTER FOR AGING STUDIES AND SERVICES

The Center offers opportunities for learning through a multi-disciplinary, comprehensive, gerontology/geriatrics program. The program encompasses education, training, research, and direct service activities in the field of aging throughout the University. The Center for Aging Studies and Services is based in the Department of Health Care Sciences. Its major components in the Medical Center are the programs in Geriatric Medicine and in Gerontology and the Adult and Geriatric Nurse Practitioner Program.

Geriatric Medicine Programs

The geriatric service provides primary care to patients over age 65 in outpatient clinics, specialty clinics, and the emergency room in the Medical Center. Rounds take place twice weekly at the Washington Home, a 170-bed skilled

and intermediate care nursing facility. In geriatric clinics comprehensive
sessment and follow-up of patients' physical and mental health, social and e
nomic status, and ability to carry out the tasks of daily living is coordina
and conducted by a geriatric team consisting of a geriatrician, a primary c
resident, a social worker, and a physician's assistant or nurse practitioner. S
dents may develop an area of concentration in geriatrics/gerontology throu
the Center for Aging Studies and Services.

Geriatric content is included in the second-year basic curriculum and in t
required Issues in Health Care course (HCS 369). The required primary ca
clerkship for third-year students includes a rotation on the geriatric service, a
electives in clinical geriatrics are available for first-, second-, and fourth-ye
students.

Program Activities in Gerontology

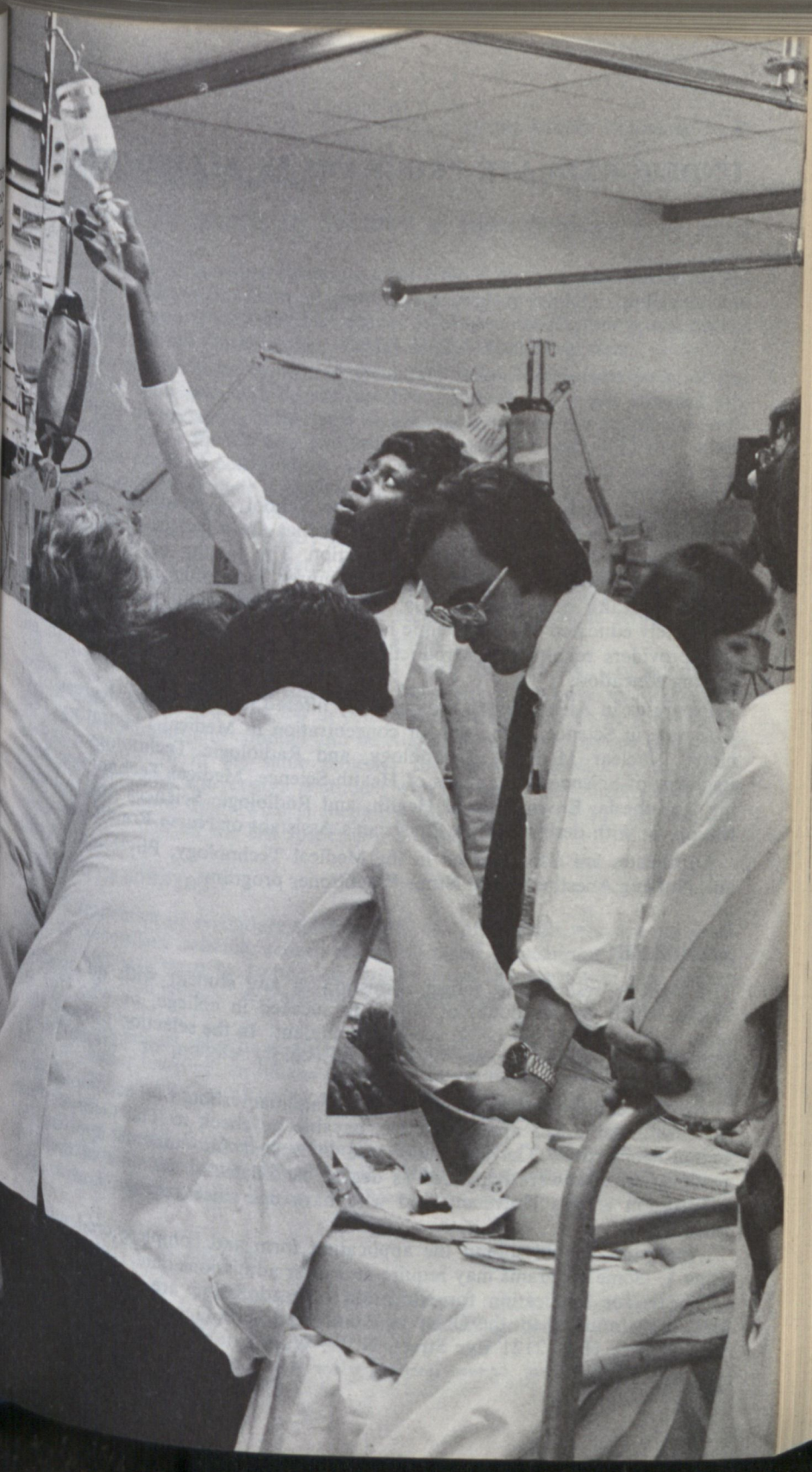
Courses with specific focus on aging are offered by several schools in th
University. A Master of Arts in Special Studies with a concentration in geron
tology is available through the Graduate School of Arts and Sciences. In add
tion to the courses under Health Care Sciences (HCS 193, 194) and under
Psychiatry and Behavioral Sciences (Pchi 417), the following courses are offered
by other University departments:

Educ 344	Adult Development and Aging
Educ 353	Counseling Older Persons
Educ 383	Interviewing-Counseling for Human Resource Developers
Gern 201	The Biology of Aging
Gern 205	Public Policy and Aging
Gern 290	Practicum in Gerontology
HSA 235	Human Services Integration
HSA 236	Introduction to Long-term Care Administration
HSA 237	Managing the Long-term Institution
HSA 255	Issues in Gerontology
Psyc 188	Attitudes toward Death and Dying
SLP 158	Society and Aging
Soc 151–52	Problems of Urban Social Systems
Soc 160	Death and Dying: A Sociological Perspective
Soc 181	Major Social Processes
Soc 254	Seminar: Methods in Social Policy Research
Soc 280	The Sociology of Aging

Two community-based service programs provide opportunities for experien-
tial learning in aging: the Professional Services Center at St. Mary's Court and
Community Projects in Aging. Both programs place students in settings in
which they can gain knowledge and experience working with older persons
under professional supervision.

Adult/Geriatric Nurse Practitioner Program

The Nurse Practitioner Program prepares registered nurses to practice main-
ly in primary care settings or long-term care facilities. The program consists of
two semesters of course work and one semester of clinical experience. A Nurse
Practitioner Traineeship from the Department of Health and Human Services
is available to students from areas with a shortage of health manpower. For
fuller detail on the curriculum of this program see HCS 142, 143, 144, 153,
and 154 and the description under Allied Health Programs.



UNDERGRADUATE PROGRAMS IN ALLIED HEALTH

Programs of study in allied health at the School of Medicine and Health Sciences include those disciplines and skills that are allied to medicine in the delivery of health care and health education. The faculty of the School recognizes that modern medical practice requires increasing numbers of non-physician health care professionals; that such allied health personnel are appropriately educated in an academic health center; and that new roles for health care providers require the introduction of new curricula in allied health and nursing education.

Programs in Allied Health are currently offered leading to the degrees of (1) Associate in Science, with areas of concentration in Medical Laboratory Technique, Nuclear Medicine Technology, and Radiologic Technology; and (2) Bachelor of Science in the fields of Health Science, Medical Technology, Nursing Anesthesia, Environmental Health, and Radiologic Sciences and Administration, or with designation as Physician's Assistant or Nurse Practitioner.

Certificates are also awarded in the Medical Technology, Physician's Assistant, Nursing Anesthesia, and Nurse Practitioner programs.

ADMISSION

The right is reserved to refuse admission to any student with an academic record which creates doubt of ability to succeed in college, or who, for any other reason, would not be an acceptable student. In the selection process, there is no discrimination because of sex, race, color, religion, or national or regional origin.

An application for admission to degree candidacy should be accompanied by a nonrefundable $15 application fee, payable by check to The George Washington University. The application fee is waived for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants should submit the application form and complete credentials by June 1. Some programs may require an earlier admissions date.

Forms for application for admission or readmission are available at, and should be returned to, the Office of Admissions, The George Washington University, Rice Hall, 2121 Eye Street, N.W., Washington, D.C. 20052.

Admission to Degree Candidacy

The following are required for admission to degree candidacy in all Allied Health programs:

1. Graduates of secondary schools must have a diploma based upon an acceptable academic record from an accredited secondary school. Applicants who have not graduated from secondary school must have satisfactory scores on the General Educational Development (GED) High School Level tests.

2. Students who have completed secondary school within two years of the date of their application for degree candidacy and who have not attended any other college or university must have acceptable scores on the Scholastic Aptitude Test (SAT) of the College Entrance Examination Board (CEEB)*; applicants without previous college work who have completed secondary school more than two years before their date of application may substitute acceptable scores on the College-Level Examination (CLEP) or acceptable scores on the General Educational Development (GED) High School Level test.

3. Students who have completed fewer than 12 semester hours of acceptable course work at an accredited college or university before applying for degree candidacy must have a secondary school record and acceptable scores on one of the three examinations listed in item 2 above.

4. Students who have completed 12 or more semester hours of acceptable course work at an accredited college or university must have maintained an overall quality-point index of 2.0 in course work; they must be in good standing as to scholarship and conduct and be eligible to return to the last previously attended institution in the same semester for which admission is sought to George Washington University. A student who has been academically dismissed or suspended more than twice is ineligible for consideration for at least five years from the date of the last suspension or dismissal.

REQUIRED CREDENTIALS

1. A transcript of secondary school work, or, for students who are not graduates of secondary schools, scores on the General Educational Development Test. Transcripts must be forwarded directly from the institution attended to the Office of Admissions. A transcript submitted directly by the student is not acceptable.

2. For applicants who have attended any college, university or other institution of higher learning, an official transcript forwarded to the Office of Admissions by each institution attended regardless of whether credit was earned or desired.

3. Scores on standardized examinations (ACT, SAT, CLEP, etc.) forwarded by the administering agency directly to the Office of Admissions.

4. Records from service schools.

ADVANCED TUITION DEPOSIT

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students, including those readmitted. This

* The College Entrance Examination Board test is preferred; however, the American College Testing battery (ACT) scores will be accepted.

deposit is due May 1 for students entering in the fall semester, and Decembe 15 for students entering in the spring semester. The deposit is credited towar tuition and is not refundable.

Admission as a Nondegree Student

A student who wishes to take individual courses in allied health programs without applying for degree candidacy must apply for admission to the Univer sity as an undergraduate unclassified student in the School of Medicine and Health Sciences. The Office of Allied Health and the chairman of the de partment offering the course shall determine whether admission will be grant ed to nondegree students. Credits earned as a nondegree student may be transferred to degree programs at the University provided the course(s) are applicable to the desired curriculum and the student meets the requirements of the degree program for which application is made.

Advanced Standing

Advanced standing does not apply to physician assistant, nurse practitioner, and nursing anesthesia certificates. However, advanced standing toward the bac calaureate degree *may* be awarded for appropriate course work completed previously at other academic institutions with a grade of *C*. Advanced standing may also be awarded for nontraditional classroom or clinical experience. Stu dents are reminded, however, that they must satisfy the residence requirement for their degree programs (see pages 61, 64) no matter how much advanced standing may be granted.

It is the responsibility of the student to have certified official transcripts of all course work taken at other institutions or the results of examinations sent by the issuing institution or agency directly to the Office of Admissions, George Wash ington University, Washington, D.C. 20052. If the applicant has fewer than 30 semester hours of acceptable credit (grades of *C* or better on academic work from an accredited institution) at the time the application is submitted, the ap plicant must have the secondary school record sent directly to the Office of Ad missions from the school.

The University reserves the right to refuse credit for transfer in part or in whole, or to allow it provisionally. Credit so given may be withdrawn for sub sequent poor work. No time limitation will be placed on the transfer of credits from other institutions, with the exception of the area of vocational compe tence (clinical applications as dictated by individual programs). Credit will not be granted for such work completed five or more years prior to applica tion unless proficiency and/or continued maintenance of skills are demon strated.

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Unlimited advanced standing may be awarded for appropriate course work completed with a minimum grade of *C* or its equivalent at other accredited in stitutions of higher learning, provided that the course is applicable to or com parable with a course in the required curriculum, or that the degree program to which the student has been admitted has provisions for elective credit toward which the credit for advanced standing may be applied. Although a grade of *D* is not acceptable for transfer, a course in which a student has

received the grade of *D* (except English) may be used to satisfy a curriculum requirement. It may not, however, be counted toward the total number of semester hours required for the degree, and it may not be repeated without the approval of the faculty advisor.

CREDIT FOR NONTRADITIONAL CLASSROOM OR CLINICAL EXPERIENCE

Assuming there is no duplication of course work earned, a maximum of 60 semester hours of advanced standing may be awarded on the basis of nontraditional classroom or clinical experience, by a combination of any of the methods listed below:

Credit from Service Schools.—A limited amount of credit may be assigned for selected service school instruction received since 1941. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

Special Departmental Examinations.—A student may request any department to offer the student a special examination covering the subject matter of any specific course. Approval of such a request is not automatically granted; the student must offer evidence of sufficient occupational or educational background to indicate a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examination will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparation, administration, and grading of the examination.

Credit for College Entrance Examination Board College-level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations (with the exception of the English composition and mathematics examinations) passed at the 50th percentile or above (college sophomore norms). Credit is assigned for the Subject Examinations passed at the level recommended in the College Board model policy. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 592, Princeton, N.J. 08540.

Credit for New York State Board of Regent's Examination.—Applicants for degrees who present proper certification of award of a degree at the Associate's level from the New York State Board of Regents *may* be awarded a maximum of 60 semester hours of advanced standing.

Credit for Correspondence Courses.—A maximum of 30 semester hours of advanced standing *may* be awarded through the successful completion of appropriate correspondence courses offered by accredited colleges and universities.

Credit through United States Armed Forces Institute (USAFI) Examinatio
—A maximum of 30 semester hours of advanced standing may be assigned f
approved United States Armed Forces Institute college-level examinatio
passed with satisfactory scores.

Credit for educational programs in industrial and other noncollegiate orga
zations.—A maximum of 12 semester hours of advanced standing may b
awarded for course work performed in noncollegiate programs using criter
developed by the American Council on Education and the New York Sta
Board of Regents.

Currently registered degree candidates must obtain permission from th
Office of Allied Health before registering to take examinations, correspondenc
courses, or courses at other accredited institutions.

Readmission

Students previously registered in the University who were not registered during
the immediately preceding semester (summer sessions excluded), must apply
for readmission. The final date for applying is the same as that for entering
students (see page 46). Students who apply as degree candidates and who
were previously registered as nondegree students, or who attended one or
more institutions of higher learning during absence from the University, must
have complete official transcripts sent to the Admissions Office of this Uni-
versity from each institution attended. Applications for readmission are con-
sidered on the basis of regulations currently effective.

The application fee is waived for students applying for readmission who
were registered as degree candidates at the time of the last registration at this
University and who have not since registered at another institution.

Students From Foreign Institutions

Application, required records, and scores on the *Test of English as a Foreign*
Language (see below) should be received from international students no
later than March 1.

REQUIRED RECORDS

Applicants must request all educational institutions attended to send *directly* to
the Office of Admissions, George Washington University, Washington, D.C.
20052, official credentials listing subjects studied, grades received, examinations
taken and degrees received. Certified copies of diplomas and certificates from
secondary schools and all colleges and universities attended are required. Rec-
ords of state examinations and certificates are also needed. All records become
the property of the University and *cannot* be returned.

These documents should be in the language in which the institution keeps
its official records. If they are in a language other than English, the copies
which are sent should be accompanied by an English translation.

LANGUAGE TESTS

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* (TOEFL), and have the scores submitted to the Office of Admissions. Students are responsible for making arrangements for taking the test by addressing inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08540, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does not constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

In addition to the TOEFL, an admitted student may be required to report to the Admissions Office to make arrangements for taking an English Placement Test for foreign students prior to registration. Results of this test will determine the courses the student will be permitted to register for in the program of study.

REGULATIONS FOR UNDERGRADUATE STUDENTS IN ALLIED HEALTH PROGRAMS

Attendance

A student may not attend classes until registration is completed and fees due are paid. A student may attend only those classes for which registered. Regular attendance is expected. A student may be dropped from any course for undue absence.

Scholarship Requirements

A student who fails to maintain the scholarship requirements of the School of Medicine and Health Sciences may be dismissed from the University.

GRADES

Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. In certain courses, an alternate grading system of *CR* (Credit) and *NC* (No Credit) may be used. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a grade of *D* or better was received, unless required to do so by the department concerned.

A written statement to this effect must be submitted to the Registrar by th appropriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Whenever a grade has not been assigned, the symbol *I* (Incomplete), the symbo *IP* (Progress), the symbol *W* (Authorized Withdrawal), or the symbol *Z* (Un authorized Withdrawal) will be recorded. The symbol *I* indicates that a satis factory explanation has been given the instructor for the student's inability t complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's con trol, is unable to complete the work of the course, and if the instructor is in formed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, the instructor may initiate an appropriate grade change. A grade of *I* automatically becomes a grade of *F* one calendar year after the date of the last class meeting in the semester for which the grade of *I* was assigned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on the student's record in this Univer sity. Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. Courses in which the grades of *W*, *I*, or *IP* are assigned are not considered in determining the index, except that a course in which the grade of *I* has been assigned will be considered when a formal grade has been recorded. Grades earned at other institutions are not considered in computing the quality-point index.

DEAN'S HONOR LIST

Students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list is limited to full time students registered for a minimum of 12 semester hours and part-time students registered for a minimum of 12 semester hours over two consecutive semesters, which may include a summer term.

PROBATION

A student who has attempted a minimum of 12 semester hours of course work and whose cumulative quality-point index is below 2.00 is placed on probation for the period in which he or she next attempts 12 additional semester hours of work. A student whose attendance or conduct has been unsatisfactory may be placed on disciplinary probation for the period in which he or she next attempts 12 additional semester hours of work.

SUSPENSION

A student whose cumulative quality-point index remains below 2.00 after a 12-semester-hour period of probation is suspended.

A student suspended for poor scholarship may not register for course work, even as an auditor. The student may apply for readmission after the lapse of either the fall or spring semester following suspension. Evidence must then be presented to the chairman of the department concerned demonstrating a better qualification to pursue college-level course work. A student suspended twice for poor scholarship may not be readmitted after the second suspension.

Withdrawal

Withdrawal from a course or from the University requires the permission of the Office of Allied Health. Permission to withdraw from the University will not be granted a student who does not have a clear financial record (see "Withdrawals and Refunds," page 58).

All charges for courses dropped without the approval of the Office of Allied Health must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

Changes in Program of Study

Changes within the School of Medicine and Health Sciences' Allied Health Programs.—A student may not substitute one course for another, drop courses (see "Withdrawal," above), change status from credit to audit or audit to credit without the approval of the Office of Allied Health.

Change from one section to another of the same course may be made with the approval of the Office of Allied Health and the chairman of the department concerned.

Change from one area of concentration to another within the School of Medicine and Health Sciences may be made with the approval of the Office of Allied Health and the chairman of the department concerned. All requirements of the course of study to which the change is made must be met.

Transfer within the University.—Application for transfer to another college, school, or division must be made to the Office of Admissions. A maximum of 30 semester hours earned in the Division of University and Summer Students may be applied toward a bachelor's degree in the School of Medicine and Health Sciences.

Credit

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

Auditing.—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Post-Admission Transfer Credit

A student who plans to attend another institution and apply credit so earned toward graduation from this University must first secure the written approval of the Office of Allied Health. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

Balance Sheet

Sometime during each undergraduate student's first semester, the Office of Allied Health will issue a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

Transcripts of Record

Official transcripts of student records are issued on request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript.

Continuous Enrollment

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned by the Office of Allied Health to inactive status (see below) he or she must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

Leave of Absence

Should a degree student find it necessary to interrupt active pursuit of the degree, he or she may petition the Office of Allied Health for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave of absence.

Inactive Status

A student may be considered in continuous pursuit of a degree while not enrolled in courses at the University when engaged in attendance at another institution with prior approval of the Office of Allied Health to have work transferred back to the GW program; completion of outstanding work in courses in which a grade of "Incomplete" was received; or non-course instructional activities unique to particular Allied Health programs.

To be enrolled in inactive status a student must request, in advance of the year or semester concerned, and be granted approval for the specific activity desired. This status is generally limited to one year; no fees are assessed students while in this status.

Graduation Requirements

Degrees are conferred in February, May, and September. Graduating Allied Health students participate only in the May commencement ceremonies of the School of Medicine and Health Sciences.

To be recommended by the Faculty for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which registered; and be free from all indebtedness to the University. Registration, either for course work or on the "continuous registration" fee basis, is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" form *must* be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship.—The student must meet the scholarship requirements for the particular degree for which registered.

Curriculum.—Minimum curriculum requirements for each degree are stated on pages 59 and 63.

Residence.—A minimum of 18 semester hours of course work in the area of concentration for the Associate in Science degree and a minimum of 30 semester hours of course work in the area of concentration for the Bachelor of Science degree must be completed while registered in the School of Medicine and Health Sciences. This requirement applies to students transferring within the University as well as to students transferring from other institutions.

Attendance and Conduct.—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

With Distinction

In all undergraduate divisions of the University a baccalaureate degree may be conferred "With Distinction," at the discretion of the faculty, if a student meets the specific requirements of the college or school in which enrolled.

Students in the Allied Health programs must have a quality-point index of 3.50 or higher in all course work taken at this institution. To be eligible a student must have completed at this institution at least one-half of the courses required for the degree.

FEES AND FINANCIAL REGULATIONS FOR UNDERGRADUATE STUDENTS IN ALLIED HEALTH PROGRAMS

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 1981 summer sessions and the academic year 1981–82.

Tuition Fees

*Full-time on-campus program (12 or more semester hours), each semester	$2,050.00
Part-time on-campus program, for each semester hour	150.00
Summer Sessions, for each semester hour	134.00

University Center Fee (charged all students registered on campus)

For students registered for 11 or more semester hours on campus: Each semester	55.50
For students registered for less than 11 semester hours on campus: For each semester hour for which the student registers	5.25

Future Tuition Increases—The University has had a policy of projecting tuition increases for four years in advance; however, the uncertainty of current economic conditions will not permit continuance of this policy. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound educational basis. Ecomonic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition may be required.

Additional Course Fees

In certain courses offered by Columbian College of Arts and Sciences, additional fees, such as laboratory and material fees, are charged as indicated in the course descriptions in the *Undergraduate and Graduate Bulletin*. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Graduation Fees

Associate in Science	$10.00
Bachelor of Science	25.00

Residence Hall Fees (see pages 15–16)

Special Fees and Deposits

Application fee	$15.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	100.00

* The annual tuition for the Nurse Practitioner and Physician's Assistant Program is $6,150.00, payable in three equal installments on or before registration for each semester. The Summer Sessions portion of the program is considered a full regular semester.

Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period	15.00
Late-payment fee (see "Payment of Fees," below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for non-payment of fees (see "Payment of Fees," below)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
For each examination to qualify for advanced standing and for each special examination	5.00
English test for foreign students (when required)	5.00
Laboratory checkout fee, for failure to check out of Chemistry laboratory by the date deadline set by the instructor*	10.00
Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each, fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following privileges: (1) the services of the Student and Alumni Career Services Office; (2) the use of the University Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *University Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration, and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. No deferred payment is permitted for the summer sessions, with the exception of full-time students in the Nurse Practitioner and Physician's Assistant Programs. Interest at the rate of eight per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period.

value of the tuition awards by $800.00 or more. Under such circumstances t student may be permitted to pay one-half of the amount due from the stude at the time of registration and to defer the balance by signing a deferred pa ment contract.

Students who fail to make any payment when due will be automatica charged a $15 late-payment fee and will be subject to the interest charge of eig per cent per annum. Accounts which become 30 days past due will be fina cially encumbered. In the event a student's account is financially encumbere the student forfeits rights to the use of deferred payment contracts in futu semesters, and the Student Accounts Office will notify the Registrar to withho grades, future registration privileges, transcripts, diplomas and other academ information until the account is settled financially. Financial settlement will re quire payment in full of all amounts due the University in addition to a finan cial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registere for credit.

Returned Checks.—A student whose check is returned unpaid by the bank fo any reason will be charged a Returned Check Fee. If the check is not paid within 15 days, the student will forfeit all rights to check cashing at the Uni versity, and future payments for tuition, dormitory, food service, and othe special fees will require payment by cash, certified check, or money order.

Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a lif insurance policy in the contract. For specific details and applications, addres inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 1910
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guid ance to students and parents.

Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedu ule must be made in writing to the Office of Allied Health. Notification to an instructor is not an acceptable notice (see "Withdrawal," page 53).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal from the University**:

   Withdrawal dated on or before Saturday of the first week of classes 90%
   Withdrawal dated on or before Saturday of the third week of classes 75%

* Regulations concerning withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes.*

Withdrawal dated on or before Saturday of the fifth week of classes 50%
Withdrawal dated after the fifth week of classes .....none

2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

FINANCIAL AID

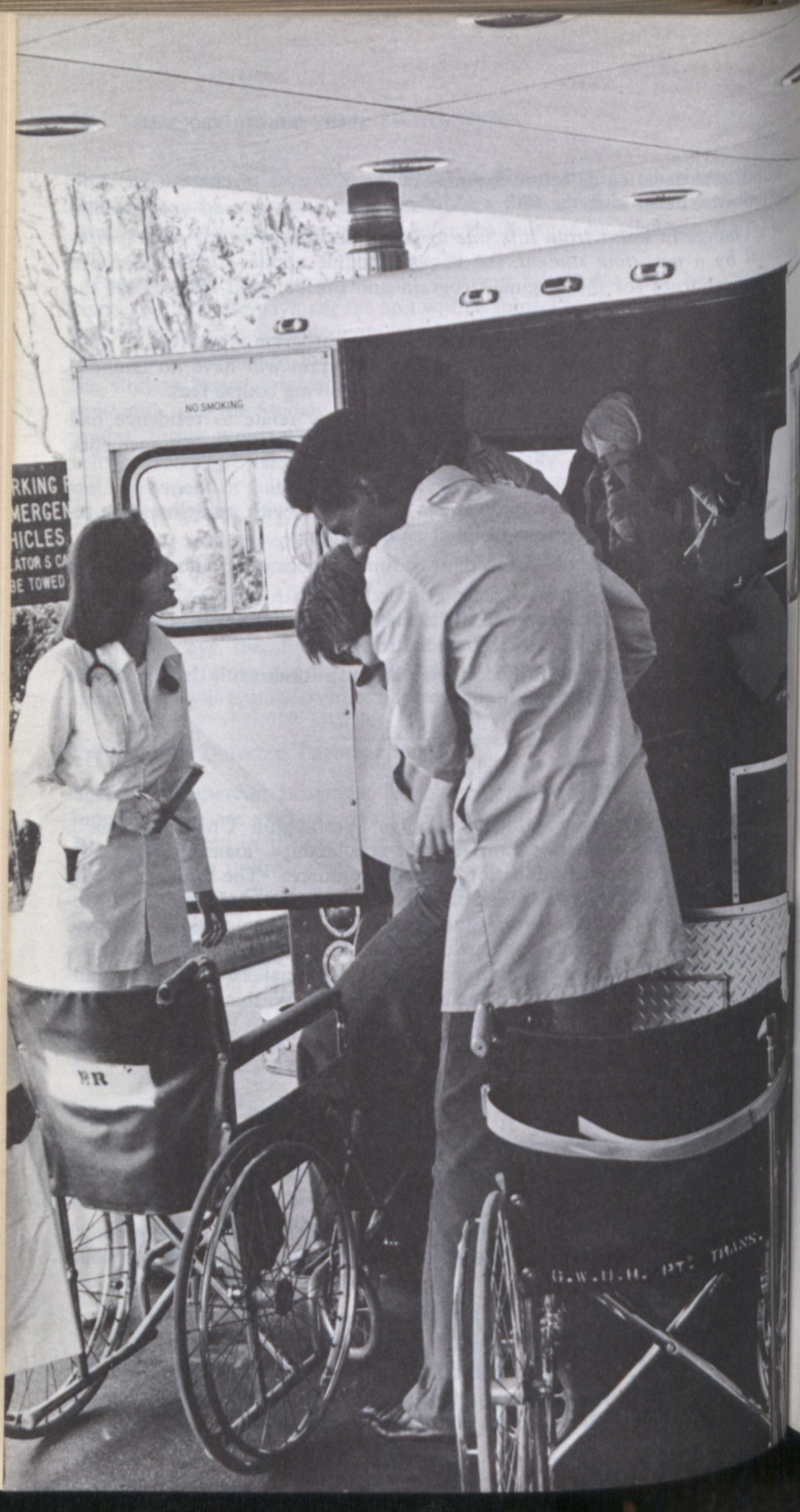
For full-time undergraduate students, George Washington University has a program of financial assistance consisting of scholarships, loans, grants, part-time employment, or any combination of these resources. The University participates in the National Direct Student Loan, Supplemental Educational Opportunity Grant, and College Work-Study programs. Financial aid is awarded on the basis of the student's scholastic record, financial need, and qualities of leadership. Complete information concerning financial assistance is available from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

REQUIREMENTS FOR THE DEGREE OF ASSOCIATE IN SCIENCE

The satisfactory completion of a minimum of 60 semester hours of course work is required for the degree of Associate in Science; however, some departments may set the requirements above the minimum. The course work must be distributed as follows:

1. **Human Competence**

   A minimum of six semester hours in English Composition (Engl 9 or 10, and 11 or 12), plus a minimum of six semester hours of meaningful initiation into the humanities, social studies, or mathematics.


NO SMOKING
G.W.U.H. PT. TRANS.

2. **Subject Competence**

   The number of semester hours required depends on the student's specific area of concentration. However, students must elect courses related to allied health sciences in biological sciences, mathematics, or physical sciences. (Students may not use the same mathematics courses to satisfy both the human competence [see above] and subject competence requirements.)

3. **Vocational Competence**

   A minimum of 30 semester hours in vocational competence skills related to the area of concentration.

4. **Elective**

   The number of elective hours depends on the number of semester hours of specific required courses the student has in the selected program of study; in some programs the student may be allowed to choose electives, but in others the student may be required to elect specific courses.

Students who plan to pursue a bachelor's degree are advised to plan their associate's degree program so that they will satisfy the prerequisites to the degree of their choice.

Scholarship Requirements

An overall quality-point index of 2.0 is required for course work leading to the degree of Associate in Science. A quality-point index of 2.50 is required for course work in the student's area of concentration. See pages 51–52 for explanation of the grading system and the quality-point index.

Residence Requirement

A minimum of 18 semester hours of course work in the area of concentration must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

MEDICAL LABORATORY TECHNIQUE PROGRAM

The program of study leading to the degree of Associate in Science with a concentration in medical laboratory technique is offered only to military students off campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 46–47. Mature students who do not meet these requirements *may* be considered for degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50. The qualifying course work must include nine semester hours in biological sciences, chemistry, or mathematics, and six semester hours in at least two other areas.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 61 semester hours of course wo is required:

Human Competence (not an area of concentration)—Engl 9 or 10 and 11 or 12 (equivalent); Math 3 and 6 (or equivalent) *or* Math 3 and either a humanities or social science elective.

Subject and Vocational Competence*—Chem 9 or 11 (or equivalent); Path 13, 14, 1 16, 17, 18, 19, and 20.

NUCLEAR MEDICINE TECHNOLOGY PROGRAM

The program of study leading to the degree of Associate in Science with a con centration in nuclear medicine technology is offered both on and off campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on page 46–47. Applicants must be at least 18 years of age by the time of first registra tion. A personal interview or a letter of recommendation may be required for some students. Mature students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50.

DEGREE REQUIREMENTS

The satisfactory completion of 60 semester hours of course work is required Bioc 101 and HCS 110 and 111, or their equivalents, are prerequisite to all other courses in nuclear medicine technology.

Human Competence (not an area of concentration)—Engl 9 or 10 and 11 or 12 (or equivalent); social science (as determined by the faculty advisor; Psyc 1 recommended); humanities (selected from art, music, philosophy, or religion).

Subject and Vocational Competence†—Rad 43, 44, 55, 56, 57, 58, 59, 65, 66, 72, 75, 81, 82, 93, 94, 98.

RADIOLOGIC TECHNOLOGY PROGRAM

The program of study leading to the degree of Associate in Science with a con centration in radiologic technology is offered only to military students off campus.

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* Area of concentration—This requirement is fulfilled by successful completion of Medical Laboratory Technique School (NEC 8506).

† Area of concentration—This requirement is fulfilled by successful completion of Nuclear Medicine Technology School (NEC 8416).

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 46–47. A personal interview or a letter of recommendation may be required for some students. Mature students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50.

DEGREE REQUIREMENTS

The satisfactory completion of 61 semester hours of course work is required:

Human Competence (not an area of concentration)—Engl 9 or 10 and 11 or 12 (or equivalent); social science (as determined by the faculty advisor); humanities (as determined by the faculty advisor).

Subject and Vocational Competence*—Rad 40, 41, 42, 50, 51, 60, 61, 62, 70, 71, 80, 90, 95, 96, 97, 99.

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

The satisfactory completion of a minimum of 120 semester hours of course work is required for Bachelor of Science programs; however, some departments may set the requirements above the minimum. The course work must be distributed as follows:

1. **Human Competence**
   A minimum of six semester hours in English composition (Engl 9 or 10, and 11 or 12) plus 24 semester hours of meaningful initiation into any two of the three general areas of the humanities, social science, or mathematics.
2. **Subject Competence**
   A minimum of 30 semester hours of didactic information related to allied health sciences. This requirement may include the biological sciences, mathematics, or the physical sciences.
3. **Vocational Competence**
   A minimum of 60 semester hours in vocational competence skills related to the area of concentration.

Scholarship Requirements

An overall quality-point index of 2.0 is required for course work in programs leading to the Bachelor of Science degree. A quality-point index of 2.50 is required for designated course work in the student's area of concentration. See pages 51–52 for explanation of the grading system and the quality-point index.

* Area of concentration—This requirement is fulfilled by successful completion of Radiologic Technology School (NEC 8452).

Residence Requirement

A minimum of 30 semester hours of course work in the area of concentra must be satisfactorily completed in residence in the School of Medicine Health Sciences.

HEALTH SCIENCES PROGRAM

The Bachelor of Science degree program in Health Science is currently offe to Advanced Hospital Corps students off campus.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is requir for the degree of Bachelor of Science in Health Science, distributed as follow

Human Competence—30 semester hours: 6 hours in English composition; 3 hou in psychology; 21 hours in the humanities and social sciences.

Subject Competence*—30 semester hours: HCS 10, 16, 15, 134, and 116 are r quired, plus an additional 16 semester hours of didactic information in the biologic sciences, mathematics, and chemistry.

Vocational Competence*—60 semester hours: HCS 92, 93, 127, 128, 102, 22, 6 68, 96, 180, 175.†

HEALTH SCIENCES—ENVIRONMENTAL HEALTH

The Bachelor of Science in Health Science degree with a major area of concen tration in Environmental Health requires the completion of a minimum of 12 semester hours of course work distributed as follows:

Human Competence—30 semester hours: A minimum of 6 semester hours of Eng lish composition, plus 24 semester hours of meaningful initiation into the humanities and social sciences.

Recommended courses are in report writing, public speaking, philosophy, litera ture, art, music, drama, economics, sociology, psychology, anthropology, politica science, human relations, or other appropriate courses.

Subject Competence—30 semester hours: A minimum of 30 semester hours of didac tic information related to allied health sciences. Course work must include a mean ingful initiation into the following areas: Mathematics (introductory algebra and trigonometry, analytic geometry, calculus, and statistics); Chemistry (inorganic and organic, biochemistry, nuclear chemistry); Physics (mechanics, heat, light, sound magnetism, electricity, modern physics); Biology (zoology, anatomy, physiology ecology).

Vocational Competence‡—60 semester hours: HCS 22, 101, 122, 184, 197, 183, 181, 182, and 199 are required, plus an additional 30 semester hours of course

* Area of concentration—This requirement is fulfilled by successful completion of Advanced Hospital Corps School (NEC 8425).

† A corresponding number of credits for approved course work in a directly applicable allied health field may be substituted for HCS 175 and 180.

‡ Core courses which constitute major area of concentration. Must be completed with a cumulative quality point index of 2.50 or better.

work directly related to environmental health. This may include supervised field experience in environmental health, or other approved courses. Credit may be awarded for successful completion of Preventive Medicine Technician School.

MEDICAL TECHNOLOGY PROGRAM

The satisfactory completion of 120 semester hours of course work is required for the degree of Bachelor of Science with a major in medical technology.

RESIDENCE REQUIREMENT

A minimum of 60 semester hours must be spent in residence for the degree of Bachelor of Science in medical technology, including the 12-month medical technology program at the University Hospital in the fourth year (Path 121, 122, 123, 124, 125, 126, 130, 131, 132, 133).

CURRICULUM

1. First Three Years

		Semester Hours
Engl:	Engl 9 or 10 and 11 or 12	6
Humanities:	Six semester hours selected from one of the following combinations: Art 31–32, 71–72; Clas 71, 72, 108, 113; Chin 163–64; Engl 51–52, 61–62, 71–72, 191–92; Fren 51–52, 60, 91–92; Ger 51–52, 103–4; Mus 3–4; Phil 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172; Rel 9–10, 59–60, 21–22, or 23 and 9; Slav 71, 91–92; Span 51–52, 91–92; SpDr 45, 49, 133, 143, 144, 165, 166, 192	6
Math:	Math 30	3
Science:	BiSc 11–12, 111; Micr 129	15
	Four semester hours selected from BiSc 104, 127, 128, 145, 148, 155, 163, 164, 165	4
Social Science:	Chem 11–12, 22, 50	16
	Six semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1–2, Hist 71–72, 39–40, 72 and 91, 40 and 91; Jour 71–72, 111 and 115; PSc 1–2; Psyc 1 and 5, 6, 8, 22, or 29; Soc 1 and 2 or Soc 1 and any 100-level sociology course	6
Electives:	Courses in humanities and social sciences	18
	Non-science and science electives	16
		90

2. Senior Year—Path 121, 122, 123, 124, 125, 126, 130, 131, 132, 133.

The fourth-year courses constitute the major. Each candidate must make application to take the 12-month medical technology program at the University Hospital; this should be done early in the third year. Although admission to the degree program does not assure acceptance into the medical technology program at the Hospital, George Washington University students are given preference. Academic achievement in the sciences, personal interviews, and letters

of recommendation will be used to evaluate candidates for admission to final year of study. An overall grade point average of 2.0 is required in or to make application to the clinical year.

PHYSICIAN ASSISTANT PROGRAM

The program leading to the degree of Bachelor of Science with designation Physician Assistant requires the satisfactory completion of 120 semester ho of course work.

ADMISSION REQUIREMENTS

The general requirements for admission to the program are stated on pag 46-47. In addition, applicants must submit evidence of satisfactory completi of two semesters of general chemistry, two semesters of psychology, and tw semesters of biological sciences (the latter may include general biology, ana omy, microbiology, or zoology, but will not include botany); completion o one year (2,000 hours) of patient care experience; and three letters of recom mendation. A personal interview is also required.

SCHOLARSHIP REQUIREMENTS

Scholarship requirements are stated on page 63. Candidates for the degre of Bachelor of Science with a designation as Physician Assistant must main tain an overall quality-point index of 2.00 for course work taken in the Phy sician Assistant program. A quality-point index of 2.50 is required for those courses designated in the core curriculum (area of concentration). Each studen must successfully complete and pass all courses for which registered in any given semester before being allowed to advance to the next semester.

RESIDENCE REQUIREMENT

A minimum of 75 semester hours in the preclinical and clinical portion of the Bachelor of Science degree curriculum must be completed in residence at the School of Medicine and Health Sciences.

ADVANCED STANDING

Advanced standing does not apply to the Physician Assistant curriculum; how ever, advanced standing toward the baccalaureate degree *may* be awarded for appropriate course work completed previously at another academic institution with a minimum grade of *C*.

DEGREE REQUIREMENTS

Satisfactory completion of a minimum of 120 semester hours is required for the Bachelor of Science degree with a designation as a Physician Assistant. Course work is distributed as follows:

Human Competence—30 semester hours: 6 hours in English composition; 24 hours in the humanities and social sciences.

Subject and Vocational Competence—92 semester hours:

Basic Health Sciences—HCS 110; Bioc 111; Micr 128; Path 129, 152; Phar 158; Phyl 111.

Basic Clinical Sciences—HCS 109, 119, 125,* 134,* 137, 140, 145, 146, 147, 148, 151.

Clinical Clerkship—HCS 160,* 163,* 166, 169, 172,* 175,* 178, 198, 199.

Other Required Courses—HCS 113, 116.

CERTIFICATE

A certificate is awarded upon completion of the 92-semester-hour sequence of required and elective courses in health care sciences.

The Bachelor of Science Degree with a designation as a Physician Assistant is also offered to military personnel off-campus. Military students in the off-campus program must complete the following courses:

Human Competence—30 semester hours: 6 semester hours in English composition; 24 semester hours in the humanities and social sciences.

Subject and Vocational Competences—90 semester hours:

Basic Health Sciences—HCS 111, 120, 121, 151.*

Basic Clinical Sciences—HCS 109, 127,* 128,* 129,* 134,* 137, 146, 147, 148.

Clinical Clerkships—HCS 167,* 169, 172,* 174,* 189, 190, 191, 192, 198.

Other Required Courses—A minimum of 30 semester hours of didactic course work must be completed in the areas of biological and physical sciences. This requirement may be waived on the basis of successful completion of Advanced Hospital Corps School (NEC 8425) or comparable course work.

NURSING ANESTHESIA PROGRAM

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 46–47. In addition, candidates for the degree must also fulfill the following requirements:

1. They must have graduated from a state-approved school of nursing. Nurses with an Associate degree may be accepted into the program after completing a minimum of twelve months of practical experience in critical-care nursing.
2. They must be licensed as registered professional nurses in at least one state, U.S. territory, or the District of Columbia.
3. They must satisfy the requirements of the school of anesthesia at one of the affiliated hospitals.

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* Designates course work in area of concentration that must be completed with a cumulative quality-point index of 2.50.

ADVANCED STANDING

The general provisions for awarding of advanced standing are stated on p 48. In addition, the following specific criteria apply for the Bachelor of Scie degree in Nursing Anesthesia in the area of subject competence.

1. Students who are graduates of two- or three-year nursing school progra and who have had a minimum of twelve months of practical expe ence in critical-care nursing *may* receive up to 45 hours of advanc standing credit in Nursing.
2. Students who have earned a B.S. degree in Nursing *may* receive up to hours of advanced standing credit in Nursing.
3. Certified Registered Nurse Anesthetists will receive credit in Nursing on an individual basis. Students seeking award of advanced standing credi on the basis of anesthesia work experience must provide evidence of dem onstrated clinical competence.

Students who graduated from nursing school more than five years ago an have not been active in nursing during the last five years may be required t take National League of Nursing or New York State Board of Regents exami nations.

SCHOLARSHIP

Students must maintain an overall quality point index of 2.50 on all nursing anesthesia courses (area of concentration). Any student who does not main tain a 2.50 average may be required to take additional course work in order t obtain a minimum 2.50 average on the 30 hours of required courses.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the Bachelor of Science degree in Nursing Anesthesia, distributed as follows:

1. Thirty semester hours of course work in the area of human competence including at least six semester hours in English (Engl 9 or 10, and 11 or 12), three semester hours in Psychology (Psyc 001), and 21 semester hours of meaningful initiation into two of the following areas—social sciences, humanities, and mathematics.
2. Thirty semester hours of course work in the area of subject competence including course work in the biological and physical sciences. (Note: Ad vanced standing credit awarded for nursing school experience may be used to fulfill this requirement.)
3. Sixty semester hours of course work in the area of vocational competence skills directly related to nursing anesthesia, consisting of the following courses:

YEAR I: Phar 21, 22, 110, 111; Anes/Phar 195, 191; HCS 110, 134; Phyl 111; Anes 198.

YEAR II: Anes 193, 194.

All students must complete Year I course work, in residence, with an overall quality-point index of 2.50 or better. Certified Registered Nurse Anesthetists

may waive Year II of clinical course work on the basis of demonstrated clinical competence after successful completion of Year I course work.

CERTIFICATE

A certificate is awarded upon completion of the 60-semester-hour sequence of required courses in the nursing anesthesia program.

NURSE PRACTITIONER PROGRAM

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 46–47. Candidates for the degree of Bachelor of Science with designation as Nurse Practitioner must also fulfill the following requirements:

1. They must have been graduated from a school of nursing with an overall quality-point index of at least 2.00 or the equivalent.
2. They must be licensed as registered nurses in at least one state or the District of Columbia.
3. They must have had a minimum of two years' experience in nursing practice in hospital and/or ambulatory settings.
4. They must have three letters of recommendation. Evaluations must be completed by *at least* one supervisor; the remainder may be submitted by present or former instructors, or by colleagues who are familiar with the applicant's health care related experience.

Preference will be given to applicants who have made arrangements with a physician or an institution to be employed as a nurse practitioner.

SCHOLARSHIP

The grades of *CR* (Credit) and *NC* (No Credit) are given. A student who has received a grade of *NC* in any of the preclinical courses will be ineligible to continue in the clinical portion of the program until the course has been repeated and a grade of *CR* has been received. Progress through each portion of the clinical phase will be evaluated by the faculty in charge of that particular rotation.

ADVANCED STANDING

General provisions for advanced standing are listed on page 48. In addition, students may receive up to 60 semester hours of advanced standing for successful completion of nursing school, which is applied toward subject competence. No advanced standing will be granted for courses in the required area of concentration.

RESIDENCE REQUIREMENT

A minimum of 45 semester hours of course work in the area of concentration must be completed in residence in the School of Medicine and Health Sciences.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is requir for the degree of Bachelor of Science with designation as a Nurse Practitione distributed as follows:

Human Competence—30 semester hours: 6 semester hours in English composition 24 semester hours in the humanities and social sciences, which may include HCS 19 and 193.

Subject and Vocational Competences—90 semester hours:

Clinical Health Sciences—HCS 110, 125, 134, 137, 140, 142, 143, 144, 145, 14 194; Micr 128; Path 129; Phyl 111.

Clinical Rotations—HCS 153, 154, 157.

Electives—HCS 165, 170, 171, 179, 180.

A minimum of 30 semester hours of course work in the physical, natural, and mathematical sciences is required. Advanced standing awarded for nursing school experience may be used to fulfill this requirement.

CERTIFICATE

Nurse Practitioner certification will be granted to those students who meet the requirements for admission to the degree program and who complete the 45 semester-hour area of concentration.

RADIOLOGIC SCIENCES AND ADMINISTRATION PROGRAM

The program leading to the degree of Bachelor of Science in the field of Radiologic Sciences and Administration requires the satisfactory completion of a minimum of 120 semester hours of course work. This program is designed for registered technologists in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology who wish to continue their education at the baccalaureate level.

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 46–47. In addition, students applying to the program must be registered technologists or registry-eligible within the first academic semester. A personal interview or a letter from the principal or dean of the school previously attended is required. Students whose previous schooling suggests inadequate preparation in physics and mathematics may be required to complete successfully Rad 92 before placement in either Rad 167 or Rad 171.

ADVANCED STANDING

General provisions for advanced standing are stated on page 48. Students may be granted up to 48 semester hours of advanced standing credit if (1)

they have completed study within the last five years, with a quality-point index of at least 2.50 or a grade average of at least 80 per cent, at a radiologic technology, nuclear medicine technology, or radiation therapy technology school that is accredited by Joint Review Committee on Education Programs in Radiologic Technology or Nuclear Medicine of the Council on Medical Education of the American Medical Association, or (2) they are certified as American Registered Radiologic Technologists, Nuclear Medicine Technologists, or Radiation Therapy Technologists.

SCHOLARSHIP

Scholarship requirements are stated on page 63.

DEGREE REQUIREMENTS

Human Competence—A minimum of 30 semester hours is required, including BAd 102, 105; Engl 9 or 10 and 11 or 12; Psyc 1; Soc 1. Recommended electives include Engl 101; Hum 26; Psyc 151; Soc 129; SpDr 111, 121; or other courses in the humanities or social sciences.

Subject and Vocational Competence—A total of 92 semester hours is required. Of these, a maximum of 48 semester hours is allowed for course work in an American Medical Association approved program in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology. The remaining 44 semester hours consist of the following required courses:

1. **Radiologic Sciences**—ClEn 101; Rad 167, 171, 175, 176 or 177, 190, 195.
2. **Radiologic Administration**—HSA 142, 153, 154, 170; Psyc 144; Rad 140, 145 or 147 or 149, 150; Soc 124.

Required or Recommended Courses in Allied Health Programs Offered in Other Divisions of the University

The following courses are offered by Columbian College of Arts and Sciences the School of Government and Business Administration, and are either requir or recommended in specific undergraduate programs in the School of Medici and Health Sciences. Students are reminded, however, that not all these cours are acceptable even as electives in certain Allied Health Programs. Student should consult with the program advisor in choosing electives for the particul program in which they are enrolled.

Courses acceptable to meet human competence requirements:

Humanities

Art History
Classics
East Asian Languages and Literatures
English
Germanic Languages and Literatures
Music
Philosophy
Religion
Romance Languages and Literatures
Slavic Languages and Literatures
Speech and Drama

Social Sciences

American Civilization
Anthropology
Economics
Geography and Regional Science
History
Journalism
Political Science
Psychology
Sociology

ACCOUNTING

1 **Introductory Accounting** (3)

Basic understanding of accounting concepts, procedures, analyses, and reports; the accounting measurement and communications of significant economic and financial data. Laboratory fee, $25 per semester.

AMERICAN CIVILIZATION

71–72 **Introduction to American Civilization** (3–3)

Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance.

ANTHROPOLOGY

1–2 **Introductory Anthropology** (3–3)

Anth 1: survey of man's origin, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior.

ART HISTORY

31–32 **Survey of Western Art** (3–3)

A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art.

71–72 **Introduction to the Arts in America** (3–3)
Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present.

BIOLOGICAL SCIENCES

11–12 **Introductory Biology for Science Majors** (4–4)
Lecture (3 hours), laboratory (3 hours). Biological principles and problems designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 per semester.

104 **Comparative Vertebrate Anatomy** (4)
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $24.

111 **Introductory Microbiology** (4)
Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $24.

127 **Genetics** (3)
Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action.

128 **Genetics Laboratory** (1)
Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $24.

148 **Histology** (4)
Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $24.

163 **Human Physiology** (3)
Introduction to the function of organ systems of the human body.

164 **Human Physiology Laboratory** (1)
Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $28.

165 **Vertebrate Physiology** (4)
Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $28.

BUSINESS ADMINISTRATION

102 **Fundamentals of Management** (3)
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking.

105 **Personnel Management** (3)
The labor force and labor markets. Industrial personnel and manpow programs, organization and policy in personnel activities.

CHEMISTRY

11–12 **General Chemistry** (4–4)
Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elemen tary course in general chemistry, including qualitative analysis. Pr requisite to Chem 11: one year of high school algebra. Prerequisite Chem 12: Chem 11. Laboratory fee, $28 per semester.

22 **Introductory Quantitative Analysis** (4)
Lecture (2 hours), laboratory (6 hours). Theory and practice of quanti tative analysis by classical methods; introduction to instrumental analysis Prerequisite: Chem 12. Laboratory fee, $28.

50 **Introduction to Organic Chemistry** (4)
Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. Prerequisite: Chem 12 or 16. Laboratory fee, $28

ECONOMICS

1–2 **Principles of Economics** (3–3)
Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics.

ENGLISH

9 **English Composition: Language as Communication** (3)
Intensive grammar and composition course for students inadequately pre pared for Engl 10. Detailed instruction, drill, and exercises in basic struc ture and writing paragraphs; also includes content covered in Engl 10. Class meets five hours per week and carries three semester hours of credit. Special fee, $25.

10 **English Composition: Language as Communication** (3)
Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure.

11 **English Composition: Language and the Arts and Sciences** (3)
Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and of diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12.

12 **English Composition: Language in Literature** (3)

Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and in diction, and on logical thought, by the study of literary genres and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11.

20 **The Writing of Reports** (3)

Offered only off campus. Theory and practice in the writing of technical reports. Prerequisite: Engl 9 or 10 and 11.

43–44 **Classical Humanities** (3–3)

Offered only off campus. Interdisciplinary study of the origins of Western thought. Reading and intensive class discussions of selections from the Bible and from five works each semester from the following authors: Homer, Hesiod, Aristophanes, Plato, Aristotle, Aeschylus, Euripides, Sophocles, Herodotus, Thucydides, Lucretius, Marcus Aurelius, Epictetus, Polybius, St. Augustine. Background lectures on the major intellectual, artistic, economic, and social movements.

45–46 **Humanities in the Modern World** (3–3)

Offered only off campus. Interdisciplinary study of modern Western thought from the Renaissance to the 20th century. Reading and intensive class discussion of five works each semester from the following authors: Machiavelli, Pope, Voltaire, Rousseau, Goethe, Tolstoy, J.S. Mill, Zola, Nietzsche, Kierkegaard, Freud, Kafka, Koestler, T.S. Eliot. Background lectures on the major intellectual, artistic, economic, and social movements.

51–52 **Introduction to English Literature** (3–3)

Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature.

71–72 **Introduction to American Literature** (3–3)

Historical survey. Engl 71: from beginnings to the Civil War. Engl 72: from the Civil War to present.

101 **Expository Writing** (3)

Types of expository writing; weekly exercises based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12.

191–92 **Introduction to European Literature** (3–3)

Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid;* dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann.

EXPERIMENTAL HUMANITIES

*26 **Environmental Issues** (3)

An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy.

*Offered jointly by the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science.

GEOGRAPHY AND REGIONAL SCIENCE

1 Introduction to Geography (3)

General survey of the systematic fields of human geography which pl a role in the analysis and interpretation of man-environment relationsh in both spatial and ecological contexts.

2 Introduction to Economic Geography (3)

Examination of the basic principles which determine the location economic activities.

HEALTH SERVICES ADMINISTRATION

142 Financial Management in Health Care Institutions (3)

Consideration of the nature, analysis, and interpretation of accountin data. Cost accounting, budgeting and internal control techniques, em phasis on their use in the management planning and control process.

153 Survey of Health Care Organization (3)

Introduction to the organization and delivery of health care services i the U.S. Emphasis on the structural features of and the resources avail able to the health care system.

154 Introduction to Hospital Management and Procedures (3)

Introduction to the structure and management of contemporary Americ hospitals; emphasis on the organization of hospital departments and on th functions of the department manager.

170 Quantitative Methods in Health Care Administration (3)

Application of quantitative methods to the health services industry. Fun damental statistical techniques enabling the student to read, comprehend critically appraise, and intelligently utilize the growing volume of quan titative research appearing in the health services literature. Familiariza tion with quantitative procedures applied to analyzing management prob lems in the operational environment. Emphasis on establishing a funda mental understanding of statistical ideas rather than upon manipulating predeveloped formulas.

HISTORY

39–40 European Civilization in Its World Context (3–3)

Hist 39: political, social, economic, and cultural history to early modern era. Hist 40: from early modern era to present.

71–72 Introduction to American History (3–3)

Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present.

MATHEMATICS

3 College Algebra (3)

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry.

6 Plane Trigonometry (3)

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor).

9 General Mathematics I (3)

Logic, sets, foundations of the number system, abstract mathematical systems, groups.

10 General Mathematics II (3)

Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices.

30 Precalculus (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry.

31 Single Variable Calculus I (3)

Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Analytic geometry. Prerequisite: Math 30 or equivalent.*

51 Mathematics for the Social and Management Sciences I (3)

Notion of function, graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration.

52 Mathematics for the Social and Management Sciences II (3)

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51 or 53.

MUSIC

3 Introduction to Musical Understanding (3)

Introductory history of musical styles, related to listening; elements and materials of music.

4 Survey of Music Literature (3)

Introductory study of musical forms, structures, and textures; aural analysis of selected literature.

* Math 30 may be waived as a prerequisite by examination on scheduled dates.

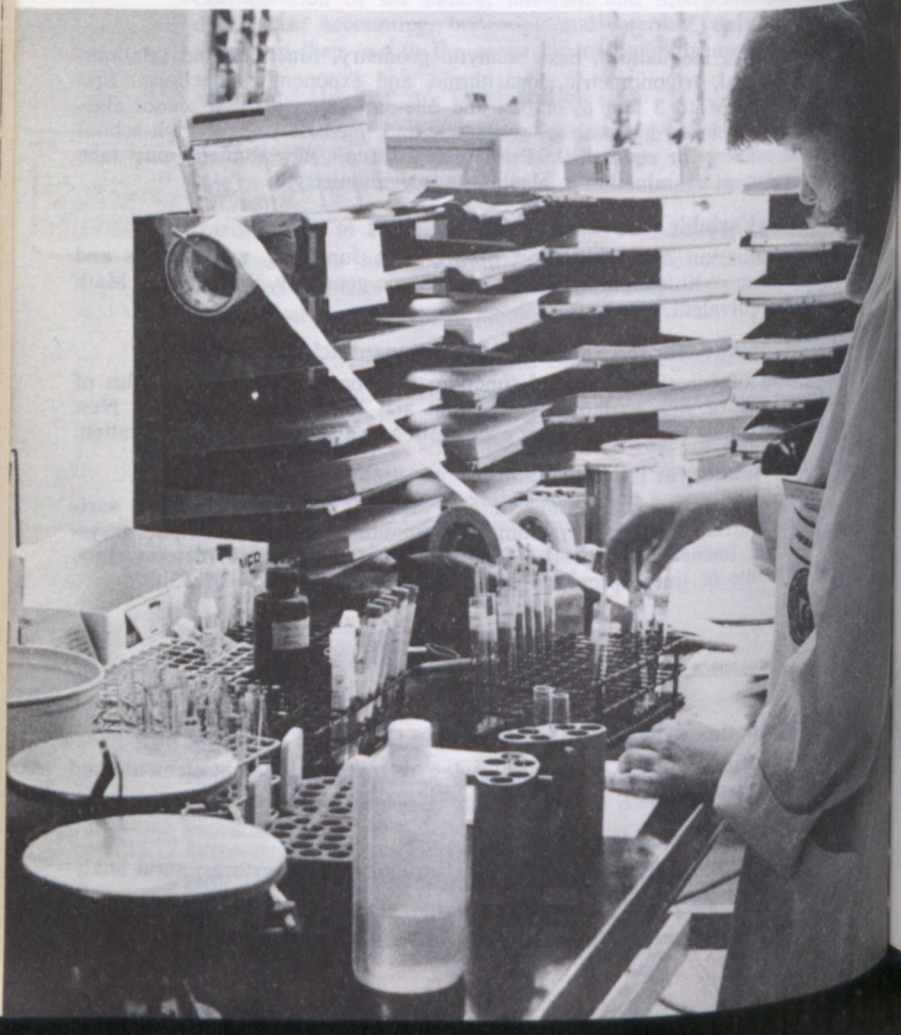
PHILOSOPHY

50 Introduction to Philosophy (3)
Readings from major philosophers and study of philosophic positions fro
Plato to Sartre.

POLITICAL SCIENCE

1 Introduction to Comparative and International Politics (3)
Comparative and international political systems; emphasis on structure
and processes of major foreign governments and the force of basi
ideologies.

2 Introduction to American Politics and Government (3)
Structure, powers, and processes of the American political system.



PSYCHOLOGY

1 General Psychology (3)
Fundamental principles underlying human behavior.

8 Psychology of Motivation and Personality (3)
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized.

22 Introduction to Educational Psychology (3)
The contributions of psychology to education; emphasis on learning.

144 Personnel and Industrial Psychology (3)
Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity.

151 Social Psychology (3)
Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism, and war.

RELIGION

9 The Hebrew Scriptures (3)
Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities.

10 The New Testament (3)
Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles.

59 Religions of the East (3)
Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto.

60 Religions of the West and Near East (3)
History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments.

SOCIOLOGY

1 Introductory Sociology (3)
General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior.

2 Major Social Issues (3)

Critical examination of three selected social issues in contemporary Am ican society.

124 Medical Sociology (3)

Social factors and processes related to the etiology and treatment of phys cal and mental illnesss; medical occupations and professions, medical o ganizations, problems of delivery of health care services.

129 Race and Minority Groups (3)

Analysis of relationships between dominant and minority groups in so ciety, particularly in the United States; nature and range of problems analysis of the phenomenon of prejudice.

SPEECH AND DRAMA

1 Communicative Speaking and Listening (3)

Basic theories and principles of speech communication; composition, de livery, and criticism of speaking in interpersonal, group and public situa tions. Recording fee, $4.

111 Business and Professional Speaking (3)

Study of the communication process in business and professional speak ing; practice in presenting technical reports; selling policies, programs and services; interviews; conferences; speech in training and supervisory activities.

121 Group Discussion and Conference Leadership (3)

Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prequisite: SpDr 1 or permission of instructor.

STATISTICS

***51 Introduction to Business and Economic Statistics** (3)

Lecture (3 hours), laboratory (1 hour). Frequency distribution, descrip tive measures, probability, sampling, estimation, tests of hypotheses, re gression and correlation, time series, index numbers. Laboratory fee, $18.

***91 Principles of Statistical Methods** (3)

Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. Laboratory fee, $18.

* Stat 51; 53, *Introduction to Statistics in Social Sciences;* and 91 are related in their subject matter and credit hours for only one of the three may be applied toward a degree.

SCHOOL OF MEDICINE AND HEALTH SCIENCES COURSES OF INSTRUCTION

The School of Medicine and Health Sciences serves other divisions of the University by making available to nonmedical students certain undergraduate and graduate courses in the following departments: anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology. The courses listed represent those offered as of July, 1980, and are subject to change. The University reserves the right to withdraw any course announced.

STAFF OF INSTRUCTION

The Staff of Instruction listed under each department and at the back of this *Bulletin* is current as of July, 1980.

EXPLANATION OF COURSE NUMBERS AND SYMBOLS

A number in parentheses after the name of the course indicates number of semester hours of credit which may be earned. Five semester hours of credit per four-week elective period are granted for all fourth-year courses in the M.D. program.

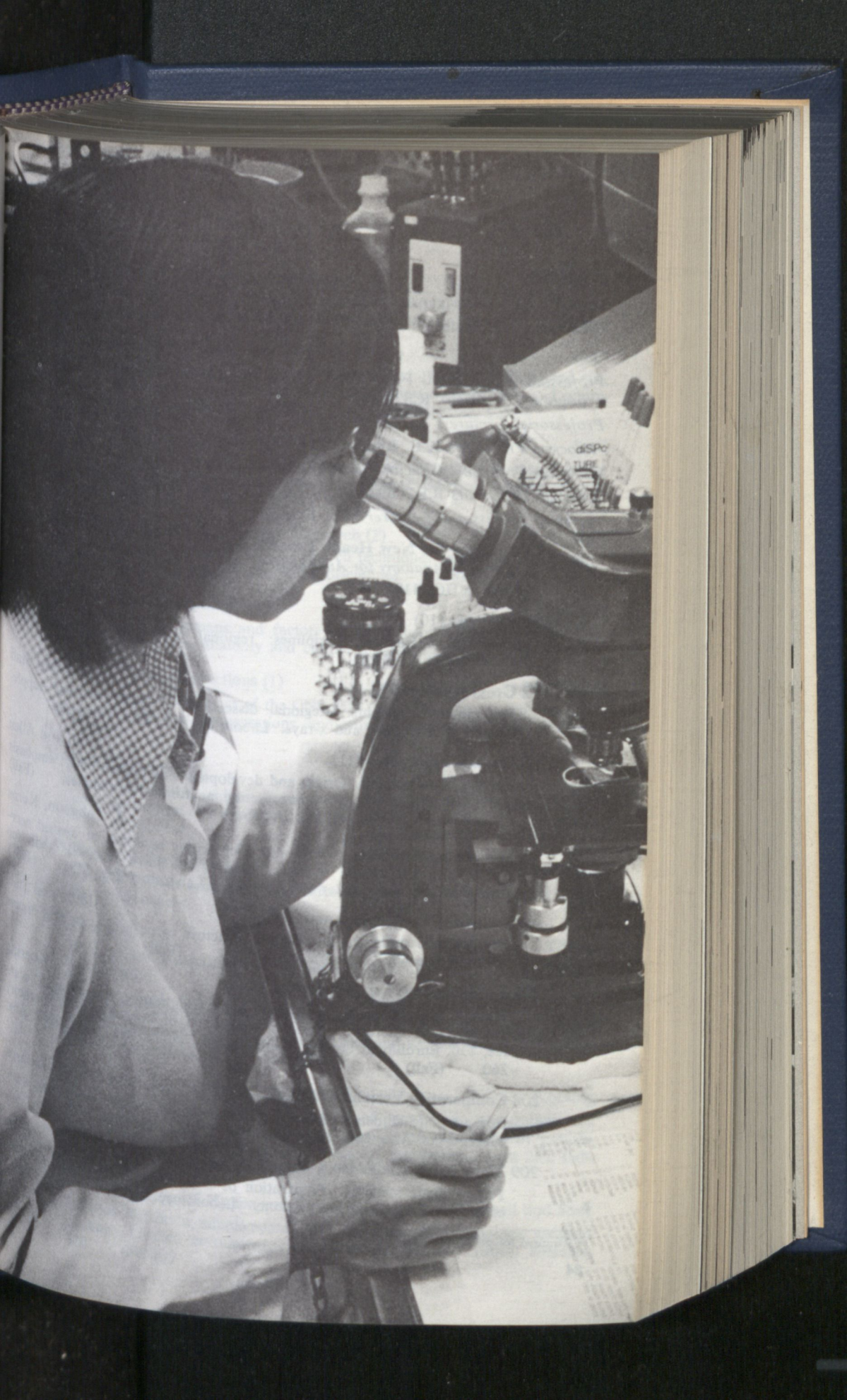
Courses numbered from 1 to 100 are for first- and second-year undergraduate allied health students. Courses numbered from 101 to 200 are for third- and fourth-year undergraduate allied health students. Courses in the basic science departments numbered from 201 to 400 are for candidates for the M.D. degree and for students in the Graduate School of Arts and Sciences. All other courses numbered from 201 to 400 are primarily for candidates for the M.D. degree.

KEY TO ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography

Chem Chemistry
Chin Chinese
CE Civil Engineering
CH&D Child Health and Development
Clas Classics
ClEn Clinical Engineering
CSci Computer Science
Derm Dermatology
Econ Economics
Educ Education
EPol Education Policy
EE Electrical Engineering
EAd Engineering Administration
EngS Engineering Science
Engl English
EFL English as a Foreign Language
EnHe Environmental Health
Envr Environmental Studies
Hum Experimental Humanities
ForS Forensic Sciences
Fren French
Gnet Genetics
Geob Geobiology
Geod Geodesy
Geog Geography and Regional Science
Geol Geology
Ger Germanic Languages and Literatures
Gern Gerontology
HCS Health Care Sciences
Hist History
HKLS Human Kinetics and Leisure Studies
HSA Health Services Administration
Idis Interdisciplinary Courses
IAf International Affairs
Ital Italian
Japn Japanese
Jour Journalism
Law Law
Mgt Management Science
Math Mathematics
ME Mechanical Engineering
M&PA Medical and Public Affairs
Med Medicine
Micr Microbiology
MStd Museum Studies
Mus Music
NSur Neurological Surgery
Neur Neurology
Ob&G Obstetrics and Gynecology
Ocea Oceanography
OR Operations Research
Opht Ophthalmology
Oral Oral Biology
Orth Orthopaedic Surgery
Otol Otolaryngology
Path Pathology
Phar Pharmacology
Phil Philosophy
Phys Physics
Phyl Physiology
PSc Political Science
Port Portuguese
Pchi Psychiatry and Behavioral Sciences
Psyc Psychology
PAd Public Administration
RSci Radiological Sciences
Rad Radiology
Rel Religion
SLP Service-Learning Program
Slav Slavic Languages and Literatures
Soc Sociology
Span Spanish
SpEd Special Education
SpDr Speech and Drama
Stat Statistics
Surg Surgery
TCom Telecommunication Operations
U&RP Urban and Regional Planning
Univ University
Urol Urology
WStu Women's Studies



Anatomy

Chairman: R.S. Snell

Professors E.N. Albert, F.D. Allan, T.N. Johnson, M.J. Koering, N.J. Papadopoulos *(Visiting)*, R.S. Snell

Professorial Lecturers J.L. Angel, M.W. Brightman, T.S. Reese

Associate Professors K.E. Johnson, D.B. Parsons *(Research)*, F.J. Slaby

Associate Professorial Lecturer J.A. Di Paolo

Assistant Professors B.E. Gilson, J.M. Kerns, J.M. Rosenstein, R.J. Walsh

Assistant Professorial Lecturer M.F. Ericksen

115 **Anatomy for New Health Practitioners** (3)
(Formerly Anatomy for Anesthetists)
Same as HCS 110.

*201 **Anatomy** (10)
Integrated anatomical disciplines: regional gross dissection, histology, embryology. (Fall)

202 **Gross Anatomy** (6)
For graduate students. Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Embryology** (1)
For graduate students. Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies.

204 **Neuroanatomy** (2)
For graduate students. Gross and microscopic anatomy of central nervous system and special senses. Students who have received credit for Anat 204 may not register for Anat 212. Laboratory fee, $13.

205 **Human Microscopic Anatomy** (3)
For graduate students. Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2)
Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1)
For graduate students. Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2)
For graduate students. Preparation of a significant audiovisual program of some aspect of human anatomy. Laboratory fee, $20. (Spring)

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* Required for medical students.

210 **The Use of Computers in Anatomy** (2) Snell
For graduate students. Applying computer techniques to the problems of learning anatomy. Limited enrollment. Laboratory fee, $20. (Spring)

212 **Neurobiology** (3) Staff
For graduate students. Same as Idis 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221–22 **Seminar** (1–1) Staff
For graduate students. Research reports and discussions of special topics by guest lecturers, staff, and graduate students. Medical students encouraged to attend. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
For graduate students. Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Angel
Variations in humans and factors affecting them, human evolution and racial differences, anatomy and culture of ancient man. (Spring)

253 **Brain Tissue Interactions** (1) Kerns and Walsh
Lectures on interactions of the CNS with muscular, sensory, and endocrine systems. Student presentations and clinical aspects will be included. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of the midgestational human fetus. Comparison of fetal and adult structures. 20 students. Laboratory fee for nonmedical students, $10. (Spring)

255 **Tissues of the Body** (1) Albert and Staff
Detailed current information on various organ systems. Prerequisite: Anat 201 or equivalent. (Spring)

256 **Teratology** (1) Gilson
Etiology and mechanisms of common congenital malformations. Limited enrollment.

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Transmission Electron Microscopy** (3) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Fall and spring)

262 **Gross Anatomy of Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

265 **Clinical Cell Biology and Electron Microscopy** (5) Alber
Investigation into clinical problems concerning atherosclerosis. 4-week elective periods.

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

272 **Autonomic Nervous System** (1) Allan
Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system. (Spring)

275 **Advanced Human Embryology** (1) Allan
Microscopic examination of the human embryo at several critical periods during embryogenesis. Prerequisite: Anat 203. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, etc. May be repeated for credit. (Spring)

279 **Applied Regional Anatomy** (5) Snell
Regional dissection, guided readings, weekly discussions. 4-week elective periods.

282 **Advanced Neuroanatomy** (5) T. Johnson
Dissection of the human brain, study of slides of the central nervous system, and an introduction to neurological research. 4-week elective periods.

284 **Applied Surface Anatomy and Radiology** (5) Snell
Detailed study of anatomical structures which are accessible to examination in the living subject; normal radiology of the body. 4-week elective periods.

285 **Application of Audio-Visual Techniques to Anatomy** (5) Allan
Students identify, develop, and produce an audio-visual program on a clinically important facet of human anatomy: gross, microscopic, developmental, or neuroanatomical. 4-week elective periods.

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance.

291 **Special Projects in Anatomy** (5) Snell
Independent study on an aspect of gross anatomy. 4-week elective periods.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

299 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
Techniques currently used in the isolation of subcellular fractions and their biochemical and morphological characterization.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Anesthesiology

Chairman: C.S. Coakley

Professors S. Alpert, C.S. Coakley, J.B. Craft, Jr., B.S. Dunbar, B.S. Epstein, W.L. Marsh, P. Mazel, G.A. Morales, R.J. Van Houten, H.D. Weintraub, J.E. Zimmerman

Associate Professors A.H. Altstatt, S.S. Edelstein, A.I. Fields, P.R. Holbrook, M.L.L. Kennedy, M.W. Lichtmann, W.A. McGill II, T.H. Oh, M.J. Shaffer, M.B.G. Shahvari, J.A.L.S. Tam

Adjunct Associate Professor R.H. Norton

Associate Clinical Professor S.N. Albert

Assistant Professors M.D. Abramowitz, M.J. Becker, A.J. Delaney, Jr., R.S. Hannallah, M.T. Karna, W.A. Knaus, D.S. Lee, G.W. Mergner, V.V. Ott, P.M. Pabon, S.V. Petkov, M.M. Pollack, V. Sidou, N.E. Soliman, B.W. Tsai, L.G. Welborn

Adjunct Assistant Professors R.L. Barth, C.C. Yu

Assistant Clinical Professors C.A. Albert, B.E. Economopoulos, H.W. Manitsas, H.F. Nicodemus, T.G. Rainey

Instructor R.I. Patel

Courses numbered 190 through 198 are for nursing anesthesia students.

190 **Seminar: Anesthesiology** (4) Staff
Small discussion groups on morbidity and mortality from actual and reported cases. Topics related to complications of anesthesia.

191 **Respiratory Care** (3) Staff
Advanced techniques for the care of patients requiring total prolonged respiratory support.

192 **Orientation for Anesthesia** (0) Staff
Lecture, group discussion, and audiovisual presentation. History of anesthesia, legal aspects, ethics, psychology, professional adjustments, department management, and organization.

193 **Methods and Procedures in Anesthesia** (4) Staff
At affiliated hospitals. Lecture, group discussion, and audiovisual presentation. Anesthesia techniques, positions in anesthesia, types of anesthetic required to meet the needs of different surgical specialties, and related topics.

194 **Principles of Clinical Anesthesia** (26) Staff
Twelve-month course at affiliated hospitals. Supervised clinical training and experience. The student is assigned patients, organizes and administers anesthesia, and follows the patients through their total hospitalization. Designed to satisfy the American Association of Nurse Anesthetists requirements.

195 **Electronics for Medical Personnel** (2) Staff
Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care units. Power, biomedical voltages and transducers, blood pressure and heart rate monitors, displays, telemetry, special purpose instruments, safety hazards analysis techniques for technical equipment procurement. (Fall)

198 **Pathological Physiology and Anesthesia** (3) Staff
Review of patho-physiology of major organ systems in relation to anesthesia. Clinical implications of various disease states, their interactions with anesthetics, and effects on anesthetic management.

210 **Anesthesiology Research Laboratory** (2) Craft and Shahvari
Participation in and observation of the various aspects of laboratory research, including anesthesia, surgery, physiology, pharmacology, and research techniques.

211 **Biomedical Equipment Elective** (1) Shaffer
Concepts of operation and theoretical and practical applications of biomedical electronic and respiratory equipment used in patient diagnosis, therapy, and monitoring. (Spring)

*302 **Clinical Clerkship** (3) Staff
Clinical preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy, management of patients in

* Required for medical students.

coma, shock, and other problems which may be encountered in medical practice. 1 week—Univ. Hosp., 1 week—Walter Reed Gen. Hosp. or Wash. Hosp. Center. (2-week periods throughout academic year)

380 **Anesthesiology** (5) Morales

Clinical experience in preoperative evaluation; surgical, obstetrical, neurosurgical anesthesia; infant and adult resuscitation; inhalation therapy; monitoring and blood gas determinations. 4-week elective periods. Univ. Hosp.

381 **Cardiovascular Anesthesia** (5) Weintraub, Shahvari

Clinical experience in the total perioperative evaluation and management of patients with significant cardiovascular disease (open heart, major vascular, or other surgery). Techniques of data evaluation from major hemodynamic monitoring. May include participation in ongoing clinical or laboratory research projects. 4-week elective periods. Univ. Hosp.

382 **Neurosurgical Anesthesia** (5) Adinis

Principles of clinical management of the neurologic patient in the perioperative period. Physiology and pharmacology of intracranial pressure and cerebral blood flow and metabolism. Intracranial pressure monitoring and the effects of respiratory nursing, and physiotherapy maneuvers on neurosurgical patients. Participation in research projects in both the OR and ICU may be involved. 4-week elective periods. Univ. Hosp.

383 **Obstetrical Anesthesia** (5) Staff

Principles of the clinical management of the obstetrical patient in the peridelivery period. Physiologic alterations of pregnancy and perinatal pharmacology. Participation in the research laboratory using the chronic maternal-fetal sheep preparation, and in clinical research projects. 4-week elective periods. Univ. Hosp.

384 **Intensive Care Unit** (5) Shahvari, Zimmerman

Evaluation and management of respiratory failure, rationale and use of automatic ventilators, chronic airway management, cardiovascular support, and intensive care. 4-week elective periods. Univ. Hosp.

386 **Intensive Care Unit** (5) Staff

Evaluation and management of respiratory failure, rationale and use of automatic ventilators, airway management, cardiovascular support techniques, and intensive care medicine. 4-week elective periods. Nat'l Naval Med. Center.

390 **Extramural Anesthesiology Elective** (arr.) Morales

The department arranges for students to spend elective periods at other institutions. Interested students should contact Dr. George Morales.

Biochemistry

Chairman: A.L. Goldstein

Professors J.M. Bailey, A.L. Goldstein, H.H. Hess, D.H. Pluznik *(Visiting)*, B.W. Smith, G.V. Vahouny

Clinical Professor O.I. Dodek, Jr.

Professorial Lecturers E.P. Anderson, W.W. Burr, Jr., P.H. Fishman, G. Guroff, P.J. Marangos, C.R. Merril, M.L. Minthorn, Jr., A.N. Schechter, J.C. Smith, E. Steers, Jr.

Associate Professors L.L. Gallo, A. Kumar, G.B. Thurman *(Research)*, G.A. Walker

Adjunct Associate Professors J.N. Ihle, M.M. Zatz

Assistant Professors T.W. Moody, R.S. Schulof

Assistant Research Professors R.W. Bryant, Jr., D. Irwin, R.E. Lockard, C.F. Low, T.L. Low, R.A. Muesing, M.A. Vander Maten, J.Y. Vanderhoek

101 **Chemistry for Allied Health Science** (2) Trichilo

For Allied Health students. Basic concepts of general and organic chemistry. (Fall)

111 **Biochemistry for Allied Health Science** (4) Walker

For Allied Health students. Basic concepts of biochemistry and their relation to the allied health field. (Fall)

201 **Medical Biochemistry** (8) Walker and Staff

For medical students only. Lecture and laboratory; emphasis on basic principles and their relation to medicine. (Fall)

205 **Biochemistry of Organ Function** (1) Kramer

For medical students; open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems, application of these processes to evaluation of function. (Spring)

207 **Human Nutrition** (1) Gallo, Treadwell, Walker

Seminar course for medical students. Application of nutritional principles to clinical problems. (Spring)

208 **Extramural Biochemistry Elective** (arr.) Walker

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the coordinator of medical biochemistry. (Fall and spring)

209 **Research Elective in Medical Biochemistry** (arr.) Staff

For senior medical students. Research in areas currently under investigation in the department. 8-week elective periods. Interested students should contact the coordinator of medical biochemistry. (Fall and spring)

212 **Readings in Cell and Molecular Biology** (arr.) Kumar

For senior medical students. Directed readings on current research work in recombinate DNA and the application of gene cloning in the understanding of selected clinical disorders. (Fall and spring)

213 **Readings in Immunology** (arr.) Goldstein

For senior medical students. A directed reading course in clinical immunology. (Fall and spring)

221–22 **General Biochemistry** (3–4) Gallo and Staff

A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Prerequisite: Chem 152, 154. (Academic year)

225–26 **Introduction to Biochemical Research** (2–4) Smith and Staff

Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used in those units. Limited to students in the Department of Biochemistry graduate program. (Academic year)

227 **Biochemistry Seminar** (1) Bryant and VanderMaten

Current literature in biochemistry. Open to graduate students in the biomedical sciences and to a limited number of medical students. May be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (2) E. Anderson

(Formerly 1 credit)

Content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 201 or 221. (Spring)

230 **Current Topics in Enzymology** (2) Bailey and Staff

Directed readings in various areas of enzymology. May be repeated for credit. Prerequisite: Bioc 229.

231 **Bioenergetics** (2) Staff

Content includes laws of thermodynamics, application of these laws to biological systems; oxidation—reduction processes and other special topics. Prerequisite: Bioc 221–22. (Fall)

232 **Protein Chemistry** (2) Steers and Schechter

(Formerly Bioc 232 and 233, 1 credit each)

Content includes the theory and methods of protein chemistry, the structure–function relationship of proteins and other special topics. Prerequisite: Bioc 201 or 221. (Fall)

240 **Nutrition** (2) Walker and Staff

Content includes discussion of RDA, nitrogen-balance, vitamins and minerals, diets, and other special topics. Prerequisite: Bioc 201 or 221–22. (Spring)

241 **Current Topics in Nutrition** (2) Walker and Staff

(Formerly Isotopes)

Directed literature readings in various areas of nutrition. May be repeated for credit. Prerequisite: Bioc 240.

250 **Cell and Molecular Biology** (2) Kumar and St

Content includes the organization and replication of genetic mater transcriptional and translational machinery, regulation of eukaryotic g expression, and other special topics. Prerequisite: Bioc 201 or 221- (Fall)

251 **Current Topics in Molecular Biology** (2) Kumar and St

Directed readings in the area of molecular biology. May be repeated f credit. Prerequisite: Bioc 250.

252 **Biochemical and Molecular Aspects of Selected Diseases** (2) Irwin and Staf

(Formerly Biochemistry of Nervous Tissue Function)

Emphasis on the biochemical and molecular aspects of selected majo diseases. The format will be of a tutorial type, including presentations o material by students. (Spring)

260 **Lipids** (2) Gallo and Vanderhoe

Content includes the biosynthesis, metabolism, and functions of lipopro teins, prostaglandins, and other special topics. Prerequisite: Bioc 221–22 (Spring)

261 **Current Topics in Lipids** (2) Vahouny and Staf

Directed readings in the area of lipid biochemistry. May be repeated fo credit. Prerequisite: Bioc 260.

263 **Steroids** (2) Dodd

For medical students; open to a limited number of graduate students. Content includes chemistry of steroids pathways of biosynthesis and metab olism, clinical manifestations of steroid unbalance, steroid changes in pregnancy and other special topics. Prerequisite: Bioc 201 or 221–22 (Spring)

270 **Biochemistry of the Immune Response** (2) Goldstein and Staf

Immunoglobulin structure, function, and regulation; complement system biochemistry of mediators of cellular immunity; molecular biology of the differentiation of the immune system. Prerequisite: Bioc 201 or 221–22 (Spring)

271 **Current Topics in Immunology** (2) Goldstein and Staf

Directed readings in the area of biochemical immunology. May be repeat- ed for credit. Prerequisite: Bioc 270.

280 **Biochemistry of Nerve Tissue** (2) Staff

Content includes molecular structure and function of nerve tissue; intra- and interneuronal communication mechanisms; biochemistry of various brain dysfunctions; and other special topics. Prerequisite: Bioc 201 or 221–22. (Fall)

295 **Research in Biochemistry** (arr.) Staff

Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Con- tent differs each time course is offered. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. **(Fall and spring)**

Child Health and Development

Chairman: R.H. Parrott
Associate Chairmen: F.C. Green *(Child Health Advocacy)*, D.W. Delaney *(House Staff and Medical Care)*, J.L. Todaro *(Student Affairs)*, J.G. Randolph *(Surgical Division)*
Directors of Divisions: R.A. Sly *(Allergy)*, F.C. Green *(Ambulatory Medicine)*, L.P. Scott *(Cardiology)*, M.L. Elgart *(Dermatology)*, W. Hung *(Endocrinology)*, D.W. Delaney *(General Medicine)*, S. Leiken *(Hematology)*, R.S. Chandra *(Anatomical Pathology)*, J.M. Hicks *(Clinical Laboratories)*, G.B. Avery *(Neonatology)*, S.A. Shelburne, Jr. *(Neurology)*, G.D. Eng *(Physical Medicine)*, J.H. Egans *(Psychiatry)*, W.J. McSweeney *(Radiology)*, B.S. Epstein *(Anesthesiology)*, F.M. Midgley *(Cardiovascular Surgery)*, J.G. Randolph *(General Surgery)*, T.H. Milhorat *(Neurosurgery)*, D.S. Friendly *(Ophthalmology)*, D.W. McKay *(Orthopaedics)*, J.J. McFarland, Jr. *(Otolaryngology)*, L.W. Thompson *(Plastic Surgery)*, A.B. Belman *(Urology)*

Professors J.P. Adams, R.P. Altman, G.B. Avery, C.U. Battle, A.B. Belman, R.M. Chanock, C.K. Conners, D.W. Delaney, S.A. Doxiadis *(Visiting)*, B.S. Dunbar, A.H. Einhorn, M.L. Elgart, G.D. Eng, B.S. Epstein, F.C. Green, G.R. Herer, W. Hung, A.Z. Kapikian *(Research)*, R.B. Kurz, S.L. Leikin, M. Majd, D.W. McKay, W.J. McSweeney, T.H. Milhorat, J.D. Noshpitz, J.E. Ott, R.H. Parrott, L.W. Perry, J.G. Randolph, L.P. Scott III, S.A. Shelburne, Jr., J.B. Sidbury, Jr., R.M. Sly, J.M. Wiener
Adjunct Professor A.M. Margileth
Clinical Professors S. Berman, A.B. Coleman, L. Cytryn, M. Feitel, W.A. Howard, J.J. McFarland, B. Olshaker, M.M. Parks, J.L. Rapoport, R.E. Rieger, S. Ross, M.F. Shore, J. Spurlock, W. Stark, B.M. Webb, S.I. Wolf
Professorial Lecturers M.E. Jenkins, J.A. Kenney, Jr., J.L. Sever
Associate Professors K.D. Anderson, G.P. August, G.W. Bailey, A.B. Barnet, C.D. Brandt, R.S. Chandra, G.J. Cohen, M.C. Edwards, J.H. Egan, C.B. Feinstein, A.I. Fields, A.B. Fletcher, D.S. Friendly, F.M. Galioto, A.M. Glasgow, L.W. Greenberg, J.M.B. Hicks, P.R. Holbrook, R.E. Johnsonbaugh, H.W. Kim, W.A. McGill II, F.M. Midgley, N. Movassaghi, S.S.

Nason, J.W. Oberman, T.H. Oh, M.N. Ozer *(Research)*, M.M. Platt, B.
Potter, K. Ravenscroft, Jr., C.A. Rigg, W.J. Rodriguez, U.E. Ruttimann
(Research), E.J. Ruley, S.R. Shapiro, T.J. Silber, J.A.L.S. Tam, L.W. Thom-
son, J.W.L. Todaro, P.J. Varghese, I.P. Weiss, J.H. Wise, M.R.D. Wolf

Adjunct Associate Professor R.B. Kielich

Associate Clinical Professors T.H. Anders, G.A. Balfour, P.C. Brunschwyg
J.L. Chamberlain III, G.G. Cochran, R. Evans III, M.J. Fischer, D.J. Fis
man, J.J. Francis, M.S. Glatt, H.R. Gold, S.I. Greenspan, V.L. Guandol
G.W. Hardman, Jr., K.L. Kaplan, C.E.J. Kimball, L. Lefkowitz, J.L. Levin
I. Mahdavi, J.R.S. Malkin, A.E. Marans, W.S. McCurley, G.W. Mella, L.
Milowe, A.J. Modlin, K.B. Nelson, B.H. Ong, F.A. Pedreira, P.T. Peeble
C.B. Robinowitz, M.E. Robinson, B.C. Straight, T.J. Sullivan, G.A. Trip
A.R. Ugel

Associate Professorial Lecturer M. Engel

Assistant Professors M.D. Abramowitz, I.S. Baron-Starke, M.J. Becker, H.
Bennett, H.W. Binder, R.L.O. Boeckx, M.A. Borengasser, D.R. Brallie
C.S. Camerini-Otero, R.D. Castro, L.A.A. Champion, C.S.C. Chang, M.
Chang, V.W.C. Cheng, B.A. Copeland, A.J. Delaney, Jr., A.H. Ficker, R.
Fink, M.A. Fletcher, J.L. Gaiter, R.S.K. Gluck, K.M. Grundfast, M.S.
Hammock, R.S. Hannallah, S.H. Josephs, S.P. Kapur, M.T. Karna, J.F.
Kelleher, Jr., H.L. Kincaid, R.A. King, B.M. Koch, A.B. Livingood, N.C.
Luban, M.G. MacDonald-Ginzburg, D.B. Magilavy, M.M. Malawer, B.M.
Markle, B.J. Maron *(Research)*, C.R. Mock, T.M. Murphy, S.L. Murray
C.M. Naulty, D.W. Ochsenschlager, V.V. Ott, B.J. Peacock, M.M. Pollack
G.H. Reaman, R.B. Reff, K.N. Rosenbaum, R.N. Ruckman, J.R. Salcedo
B.L. Short, L.F. Sorkin, B.W. Tsai, J.D. Van Brakle, L.A. Vitulano, M.J.
Wagner, M.I. Weissman, L.G. Welborn, K.C. Wells

Adjunct Assistant Professor L.H. Haller

Assistant Clinical Professors D.G. Albert, M.S. Albert, S.C. Amiri, R.S.
Bashian, L.M. Beard, M.E. Bravo, I. Brook, J.M. Burgin, I.M. Chatoor-Koch
C.L.C. Chisholm, L.F. Cohen, R.H. Coleman, T.M. Connor, L.A. Cove
G.W. Daisley, Jr., M.M. Davis, M.L. Feldman, M.R.J. Fox, T. Frey, S.J.
Friedman, A. Gaisin, H.B. Gould, S.C. Goyal, A.P. Guarinello, D.P. Ham
burger, G. Joseph, A.J. Kinnane, B.J. Landau, P.C. Latkin, M.E. Lederman
J.A. Lowe, T.J. Lustberg, H.A. Mangold, R.L. McDowell, Jr., D.H. Mc
Knew, Jr., H.M. Meagher, E.S. Meid, R.J. Mier, J.F. Morales, P.J. Nachas
ski, R.A. Nover, J.F. O'Neill, M.R. Ortega, V.E. Powell, C.A. Renschler
R.S. Rixse, C.A.B. Schulman, R.H. Schwartz, A.E. Schweitzer, B.A. Shaver
K.O. Simrel, R.L. Steerman, A.H. Stein, F. Strassburger, A. Tantisunthorn
E.S. Taylor, I.C. Williams, S.B.W. Wooten, A.B. Zients

Instructors D.L. Loiselle *(Research)*, R.I. Patel, M.D. Tolpin *(Research)*

Adjunct Instructor E.A. Black

Clinical Instructors G.J. Bergman, B.S. Bruner, S.J. Coleman, Jr., P.A. Coyne
M.W. Datch, R.A. De Vine-Curcio, K.Z. Fowler, W.A. Fried, A.E. Gober
E.M. Hall, H.L. Kaftarian, S.S. Kessel, G.M. Korengold, E.A.G. Pinder
M. Rokni, P.C. Sandiford, S.A. Shanahan, F.L. Stroud, J.A. Vander Walde
H.T. Vollero, N.M. Zaldivar

Special Lecturers J.H. Bayly, C.M. Berlin, J.D. Blake, J.A. Bottiglione, E.J. Feroli, A.L. Knasel, M.I. Michael, M.I. Mones, E.G. Moses, M. Schuelein, I. Seiler, R.B. Shearin

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*303 **Pediatric Clerkship** (10) Todaro
Full-time, as part of resident team; ward rounds; work in out-patient department and specialty clinics under staff supervision; child psychiatry and child guidance, lectures, clinical conferences, grand rounds. Children's Hosp. (Annual, continuous 8-week rotation)

360 **Clinical Pediatrics Acting Internship: Adolescent Unit** (5) Todaro
4-week elective periods. Children's Hosp.

361 **Clinical Pediatrics Acting Internship: Infectious Diseases** (5) Todaro
4-week elective periods. Children's Hosp.

362 **Clinical Pediatrics Acting Internship: General Medicine** (5) Todaro
Children aged 2 months-3 years. 4-week elective periods. Children's Hosp.

363 **Clinical Pediatrics Acting Internship: Hematology, Pulmonary Medicine** (5) Todaro
Children aged 3 months-12 years. 4-week elective periods. Children's Hosp.

364 **Clinical Pediatrics Acting Internship: Out-Patient** (5) Todaro
4-week elective periods. Children's Hosp.

365 **Clinical Pediatrics Acting Internship** (5) Van Brakle
Ward and ambulatory services. Lectures, conferences, rounds. 4-week elective periods. Holy Cross Hosp.

371 **Pediatric Gastroenterology** (5) Todaro
In-patient and out-patient management of infants and children with gastrointestinal disease. Common procedures performed in gastroenterology (endoscopy, jejunal biopsy, liver biopsy, sigmoidoscopy). 4-week elective periods. Children's Hosp.

372 **Pediatric Out-Patient Medicine** (5) Cohen, Margileth
Diagnosis and management of common ambulatory problems under the supervision of an attending physician and senior resident. 4-week elective period. Children's Hosp.

373 **Pediatric Urology** (5) Belman
Participation in clinical approaches on an inpatient and outpatient basis. Assessment, diagnostic evaluation and the participation in surgical problems. 4-week elective periods. Children's Hosp.

374 **Pediatric Orthopaedic Surgery** (5) McKay
4-week elective periods. Children's Hosp.

375 **Pediatric Surgery** (5) Randolph
Participation in an active, closely supervised surgical service for infants and children, including congenital defects, cardiac surgery, trauma, and neoplasms. 4-week elective periods. Children's Hosp.

* Required for medical students.

376 Pediatric Neurology (5) Shelbur

Participation in diagnostic and therapeutic studies on inpatients and ou patients. Rounds, conferences, seminars. 4-week elective periods. Children Hosp.

378 Genetics (5) Rosenbaum

Principles of basic human genetics with emphasis on the dysmorphic child, chromosomal aberrations and genetic counselling. Opportunity t work in the genetic laboratory and to learn chromosomal techniques 4-week elective periods. Children's Hosp.

379 Pediatric Intensive Care (5) Holbrook, Fields, Pollack

Clinical and didactic material on the pathophysiology and treatment o life-threatening illnesses, conditions, or injuries in childhood. Limited patient responsibility, extensive patient contact. Night call arranged indi vidually. 4-week elective periods. Children's Hosp.

380 Development Disabilities (5) Battle

Theoretical issues of development, clinical appraisal, and intervention strategies for disability in vision, audition, motor functions, cognition, language, feeling, and affective development. Intensive review of normal development in all areas. Weekly reading assignments, written projects, and tutorial discussion sessions. Hosp. for Sick Children.

381 Pediatric Allergy and Immunology (5) Sly

Introduction to pediatric allergy and clinical immunology; clinics and wards. Some experience in experimental techniques, pulmonary function testing, and objective methods of clinical evaluation. Children's Hosp.

382 Pediatric Radiology (5) McSweeney

Participation in conferences and observation in the department; conven tional and newer non-conventional body imaging teachniques are stressed in problem solving in pediatric medicine. 4-week elective periods. Chil dren's Hosp.

383 Pulmonary Medicine (5) Fink

Detailed diagnostic and therapeutic procedures including pulmonary and nutritional manifestations and complications in cystic fibrosis patients from the newborn to those in their third decade. Medical, surgical, psy chological, and social problems of cystic fibrosis patients and their fami lies. 4-week elective periods. Children's Hosp.

385 Child Psychiatry (5) Egan

Observation of and appropriate participation in diagnostic, consultative, and follow-up work with hospitalized children and psychiatric outpatients. Clinical and theoretical conferences. Orientation to community child psy chiatry and child mental health as part of service delivery system. 4-week elective periods.

386 Pediatric Hematology (5) Champion

Clinical and laboratory studies of infants and children with hematologic disorders; bone marrow examinations. 4-week elective periods. Chil dren's Hosp.

388 **Newborn Medicine** (5) Avery, Fletcher

Observation and participation in the intensive care of infants. 4-week elective periods. Children's Hosp.

389 **Pediatric Cardiology** (5) Scott, Perry

Physical diagnosis of congenital and acquired heart diseases, interpretation of electrocardiograms and vectorcardiograms, cardiac catherizations. 4-week elective periods. Children's Hosp.

390 **Extramural Pediatric Elective** (arr.)

The department makes arrangements for students to spend elective periods at other institutions. Interested students should contact Dr. Jane Todaro after they have obtained the following: (1) a letter of approval from the Dean for Academic Affairs, (2) a description of the course or courses to be taken, and (3) a description of the affiliations of the other institution.

392 **Adolescent Medicine** (5) Rigg, Silber

Outpatient clinical experience in diagnosis and management of problems of this age group, under supervision of senior staff and Fellows. Participation in consultative clinics, multidisciplinary interviewing conferences, medical teaching conferences, Adolescent Grand Rounds, and twice-weekly conferences with department chairmen. 4-week elective periods.

394 **Pediatric Clinical Laboratory** (5) Hicks

Laboratory studies of infants and children correlated with clinical disease. In-depth review of laboratory diagnostic studies. 4-week elective periods. Children's Hosp.

395 **Pediatric Endocrinology and Metabolism** (5) Hung, August, Glasgow

Observation of evaluation of patients with endocrine and metabolic disorders. Participation in planning of diagnostic and therapeutic programs for patients in an office setting. 4-week elective periods. Children's Hosp.

396 **Approach to Care of Child with Handicapping Condition** (5) Battle

Multidisciplinary approach to care of children with multiple handicaps, developmental delay, and/or chronic illness, in clinical assessments, therapy sessions, and interdisciplinary conferences. Reaction and behaviors of the child, family, and staff will be explored. Weekly reading assignment, written projects, and tutorial discussion sessions. Hosp. for Sick Children.

397 **Pediatric Nephrology** (5) Ruley

Clinical nephrology, hemodialysis, and research opportunities in immunologic causes of renal disease, complement abnormalities, vitamin D metabolism, acid-base physiology, renal physiology, and calcium metabolism. 4-week elective periods. Children's Hosp.

398 **Comprehensive Care** (5) Oberman

Participating in both sick- and well-child care as administered in a comprehensive setting; experience in multidisciplinary approach; cooperative planning with other community agencies. 4-week elective periods. Comprehensive Health Care Program.

Clinical Engineering

Chairman: W.S. Yamamoto

Professors H.V. Pipberger, W.S. Yamamoto
Adjunct Professors L.E. Lipkin, J.K. Weston
Professorial Lecturer B. Kemp
Associate Professors R.A. Dunn *(Research)*, H.F. Orthner
Assistant Professors W. Knaus, H.Z. Pipberger *(Research)*, M.L. Severns
Assistant Clinical Professor E.A. Lopez, Jr.

101 **Practical Computing for New Health Practitioners** (3)
For students majoring in radiologic science and administration. Design to familiarize the student with computer systems, basic terminology, appl cations programming, and I/O equipment.

201 **Theory of Medicine** (1)
Required course for first-year medical students, covering selected topics biostatistics, epidemiology, utility, decision theory as applicable to practice of medicine. Examination of the epistemology of medicine.

351 **Clinical Engineering for Medical Students** (5)
Engineering technology as applied to medical problems. Students will assigned for tutorial instruction in the principles and practices of clinic engineering. Participation in current laboratory projects, assigned readi and study. Minicomputer and microcomputer hardware applications. Elec tive for first-, second-, and fourth-year medical students. 4-week elective periods for seniors. Warwick Bldg.

353 **Medical Computing** (5)
Aspects of computer usage, including preparation and execution of pr grams which involve clinical or research applications such as ECG analy sis, pulmonary function calculation, medical file management, mathemati cal modeling, data processing, and managerial computing. In some cases the staff may be able to supervise a student in an area of the student's choice; in general, however, the program will consist of classroom or labo ratory instruction. Elective for first-, second-, and fourth-year medical stu dents. 4-week elective periods for seniors. Warwick Bldg.

354 **Automated Medical Measurement Systems** (5)
Under supervision, the student will work in a multiphasic screening clinic and participate in the process of new implementations and in evaluation of the system. Seminar discussion of variability in clinical findings, preventive medicine, and occupational medicine. 4-week elective periods. Warwick Bldg.

390 **Extramural Clinical Engineering Elective** (arr.)
The department sponsors fourth-year students spending one or more elec tive periods at other institutions. Programs must have the prior approval of the department staff.

Dermatology

Chairman: M. Elgart

Professor **M. Elgart**
Clinical Professors C.S. Brown, T.P. Nigra
Professorial Lecturers S.K. Gottlieb, J.A. Kenney, Jr.
Associate Professors M. Braun III, M.L. Turner
Adjunct Associate Professor A. Kornhauser
Associate Clinical Professors L.J. Eanet, P.L. Repetto, Jr., O.G. Rodman, A.R. Ugel
Assistant Clinical Professors S.H. Berk, M. Chadab, L.D. Cutler, R.N. De Angelis, A. Gaisin, H.S. Golomb, R.A. Katz, W.G. Klingler, D.E. Mitchell, A. Neimanis, D.L. Pierson, D.N. Robins
Clinical Instructor B.L. Patterson

380 **Dermatology Clinic** (5) Turner

Conferences, lectures, and attendance at dermatology clinic where patients with wide variety of dermatoses are seen. Diagnosis and treatment of common skin disorders. Dermatologic surgical procedures, technique for using liquid nitrogen, culture and identification of fungi, microscopic diagnosis of common cutaneous diseases. 4-week elective periods. Med. Fac. Assoc.

381 **Dermatology Clinic** (5) Mitchell, Klingler, Reichling

Same as Derm 380. 4-week elective periods. Walter Reed Army Med. Cntr.

382 **Dermatology Clinic** (5) Rodman

Same as Derm 380. 4-week elective periods. Walter Reed Army Med. Cntr.

383 **Dermatology Clinic** (5) Neimanis

Same as Derm 380. 4-week elective periods. Andrews AFB Hosp.

385 **Dermatology in General Medicine** (5) Nigra

Dermatology as related to internal medicine. Mechanisms of diseases; in-depth approach to dermatologic-medical problems; advanced reading. 4-week elective periods. Wash. Hosp. Center.

386 **Private Office Practices** (5) Staff

4-week elective periods.

387 **Clinical Dermatology** (5) Fischman*

Introduction to clinical dermatology, by working in the out-patient dermatology clinic, observing in-patient consultations, reviewing histopathology, performing skin biopsies. Close supervision by staff. Interview required. 4-week elective periods. VA Hosp.

* Dr. Fischman is Chief of the Dermatology Service at the Veterans Administration Hospital.

390 **Extramural Dermatology Elective** (arr.)

The department makes arrangements for students to spend 4-week elec periods at other institutions. Interested students should contact the cha man of the department.

Health Care Sciences

Chairman: J.E. Ott

Director of Division of Geriatric Medicine: V.A. Portnoi

Professors P.S. Birnbaum, F.C. Green, R.I. Keimowitz, J.C. LaRosa, J.E. O T.E. Piemme

Clinical Professor A.B. Rosenbaum

Professorial Lecturer S.F. Fiscina

Associate Professors G.W. Bailey, S.S. Edelstein, L.G. Pawlson, V.A. Portno L.I. Sank, P.J. Steinglass, A.W. Stone, J.M. Wise

Adjunct Associate Professor F. Mullan

Associate Clinical Professors E.J. Hinman, R.A. Millington, S.J.N. Sugar, W. Washington, Jr.

Associate Professorial Lecturers J.L. Falkson, T.M. Kao

Assistant Professors H.J. Bennett, B.C. Blatt, W.G. Boren, L.K. Davies, C Davis, K.K. Davis, M.S. Donaldson *(Research)*, D.S. Edge, N.Z. Einste R.A. Ferreras, H.D. Goldstein, D.A. Guida, J.K. Johnson, K.R. Katterjoh D.J. Lynn, G.J. Povar, R.K. Riegelman, C.S. Shaffer, J.R. Shapiro, R. Shesser, C.T. Spiegel, W.A. Stein, G.P. Thomas, M.J. Wagner, M.I. Wei man

Adjunct Assistant Professors J.H. Nicklason, M.R. Silverman

Assistant Clinical Professors R.S. Ackart, E.S. Amis, Jr., D.S. Anderson, Avrunin, R.A. Berenson, T.G. Carlton, E. Diamond, K.S. Doner, N.S Dysart, Jr., W.R. Ehrmantraut, R.L. Fassett, G.R. Freeland, F.J. Garz Torres, E.F. Gottlieb, A.P. Guarinello, M.N. Hamm, R.D. Handy, J. Harman, W.O. Harrison, R.F. Hinckley, J.D. Hines, R.D. Honablue, J K.R. Kahn, R.W. Klofkorn, T.B. Kulb, J.P. Lucas, G. Mara, D. Mart C.B. Mount, S.A. Muller, M.O. Murphy, M.A. Paske, H.A. Pincus, F. Purvis, W.D. Roche, Jr., R.F. Schillaci, T.A. Schultz, G.M. Shumaik, S. Steele, Jr., H.J. Steinfeld, J.K. Summitt, H.M. Tape, T.E. Walsh

Assistant Professorial Lecturers D.O. Johnson, J.K. Miller, S.E.H. Ra E.M. Taft

Instructors J.M. Mitchell, M.S. Smith

Adjunct Instructor N.M. Hoover

Clinical Instructors J.C. Arnett, Jr., D.T. Chua, N.T. Connally, H.J. Hopp mann, H. Jackson, G.A. Logsdon, R.W. Morris, J.A. Noronha, J.C. Noyes

Special Lecturers S.C. Beuttel, L. Brodie, G.W. Dumas, H.B. Firestone, D.L. Gilligan, T.J. Halloran, P.J. Kovalcik, J.B. Laskowski, E.E. Leclerc, J.L. McDonald, S.C. Miller, S.A. Mitchell, H.L. Parlette III, A.E. Randall, L.J. Rice, D.S. Richardson, D.A. Riggs, F.P. Scazzafavo, L.R. Smith, K.L. Thomas, D.H. Thompson, M.T. Threatt

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Courses numbered from 10 through 96 are limited to military personnel in off-campus health sciences programs.

10 **Anatomy and Physiology** (3) Staff

Study of the human body: esteology, arthrology, myology, hematology, immunology; circulatory, respiratory, digestive, endocrine, excretory, nervous, and reproductive systems.

11 **Applied Anatomy and Physiology** (6) Staff

Application of anatomical and physiological principles. Control of hemorrhage, methods of resuscitation, management of shock, relief of pain; physical examination, nutrition, fluid and electrolyte balance, respiratory conditions, childbirth.

15 **Pharmacology and Toxicology** (5) Staff

Medicinal substances used in treating people: pharmaceutical mathematics, terminology, preparations, compounding, physiological action and potential toxic reactions of certain drugs, legal aspects of drug regulations.

16 **Clinical Laboratory Techniques and Procedures** (arr.) Staff

Laboratory procedures used in basic health maintenance. Use of microscope, complete blood count, acid-fast stain, urinalysis, blood sedimentation rate, RPR card test, coagulation and bleeding time, blood grouping, blood typing.

22 **Introduction to Epidemiology** (2) Staff

Study of common communicable diseases, immunologic factors, and procedures. Contact interviewing and reporting of the communicable diseases.

67 **Disaster Sanitation** (2) Staff

Survey of nuclear, biological, and chemical hazards; emphasis on detection, personnel protection, and related functions.

68 **Environmental Sanitation** (3) Staff

Study of certain environmental factors which contribute to human health. Food, water, living and working spaces, economics, and pest control.

92 **Medical Material Management** (3) Staff

Material management in the medical facility. Budget and budgeting process, expense operating budget, purchasing, material receipt and inspection, inventory of equipment and supplies, controlled medicinals, stock record cards, surveys and adjustments, classes of plant property, property accountability, storage requirements.

93 **Health Systems Administration I** (4) Staff

Health systems organization. General office procedures, basic typing methods, standard subject identification codes, filing procedures, records disposal, security of patient information, correspondence, procedural manuals.

94 **Health Systems Administration II** (4) Staff

Planning office systems, procedures, environment, and location. Quality control, work measurement methods, authority and organizational relationships, principles of office organization, employee supervision.

95 **Records Management** (6) Staff

Public health records management. Classification of personnel, personnel records, promotions, educational services, career development, personnel orientation, medical care eligibility, patient data systems, statistical analysis.

96 **Clinical Experience** (arr.) Staff

Supervised experience and research. Application of principles learned in didactic experience to the practical situation.

101 **Environmental Biostatistics** (3)

Statistical reasoning, collection of data, rates, incidence, and prevalence. Generalization of observations and use of measurement data. For off-campus students. Staff

102 **Food and Water Sanitation** (4)

General characteristics of urban and rural water systems, treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Dairy products and food sanitation. Processing, storing, and distributing food. Supervision and training of food industry personnel. Staff

109 **Human Behavior I** (2)

Introduction to psychiatric assessments and to ways of understanding and working with a variety of patients. Problem-solving techniques are emphasized through the use of conceptual models. (Fall) Staff

110 **Anatomy for New Health Practitioners** (3)

Gross and microscopic make-up of the human body and the major organ systems: cellular, musculoskeletal, nervous, endocrine, cardiovascular, respiratory, gastrointestinal, urinary, reproductive, and integrated. Knowledge of structure at the cellular level is used to develop understanding of the organization of the human body at tissue, organ, and organ system levels. Disease processes and clinical applications are considered. Laboratory work is limited to prosected anatomical demonstrations. Staff

111 **Anatomy and Physiology** (4)

Combined course of Anat 115 and Phyl 111. For off-campus students. Staff

113 **Physician's Assistant Seminar II** (1)

Continuation of HCS 119. Prerequisite: HCS 119. (Spring) Davies

116 **Medical Terminology** (arr.)

Terminology and vocabulary basic to all areas of medical science, hospital services, and allied health specialties. (Fall) Staff

119 **Physician's Assistant Seminar I** (arr.)

Current topics of interest to the health care professional. The student will develop an understanding of his or her role in the health care system and how that role may be developed in the future. (Spring)

120 **Biochemistry for Allied Health Sciences** (2) Staff

For off-campus students.

121 **Microbiology** (2) Staff

See Micr 128. For off-campus students.

122 **Public Health Microbiology** (3)

General applied concepts of microbiology, fundamental immunologic concepts, general principles of virology, development of a surveillance protocol for nosocomial infection. For off-campus students.

125 **Manifestations of Disease** (arr.) Staff

An intradisciplinary course presenting the pathologic and abnormal structure and function encountered in clinical disease states. A functional approach to clinical medicine, including sign symptoms and diagnosis of disease states. Prerequisite: HCS 110, 112; Phyl 111. (Spring)

127–28–29 **Clinical Medicine** (arr.)

Same as HCS 125–126. For off-campus students.

131 **Human Behavior II** (2) Staff

Continuation of HCS 109. Prerequisite: HCS 109. (Spring)

134 **Clinical Assessment** (arr.) Staff

Clinical interviewing (or history taking), and physical examination, designed to permit the student to achieve a beginner's level of clinical competence, defined in terms of attitudes and behavior, clinical skills, and fundamental knowledge. (Fall)

137 **Issues in Health Care** (1) Pawlson

The focus of the course will be on the interface between the individual practitioner-patient interaction and the various forces of society which have a major impact on the practitioner and the patient. The contribution of law, ethics, economics, and government to the health care system will be introduced in lectures and panel discussions, and illustrated with case reports. (Spring)

140 **Clinical-Pathological Correlation** (2) Staff

Three hours a week for 8 weeks. Format for case presentations and proper method for clinical integration of signs and symptoms of disease. Prerequisite: HCS 116. (Spring)

142 **Nurse Practitioner Seminar I** (2) Johnson

Family dynamics, role resocialization, and current issues influencing development of the nurse practitioner role.

143 **Nurse Practitioner Seminar II** (2) Johnson

Continuation of HCS 142.

144 **Nurse Practitioner Seminar III** (2) Johnson

Continuation of HCS 142 and 143.

145 **Primary Care and Therapeutics** (2) Staff

Common office pediatric and adult medicine problems. Lectures, case presentations, and audiovisual presentations.

146 **Surgical and Diagnostic Procedures** (1) Staf

Fundamentals for performing several diagnostic and surgical procedure Basics for preparation and execution of procedures such as venipunctur suturing, intravenous infusion. Proper surgical decorum, development working knowledge of various surgical instruments and sutures. (Spring

147 **Introduction to Radiology** (1) Staf

Emphasis on basic language, science, and principles of radiology, inclu ing such aspects as safety, positioning, protection-requesting studies, et Basic elements of topographic anatomy as applied to radiology. The di ferentiation of abnormal from normal on chest, abdominal, and extremi films. Basic pattern recognition along with a systematic approach to eac x-ray interpretation. (Fall)

148 **Introduction to Electrocardiography** (1) Staf

Emphasis on the performance of a technically competent electrocardio gram by each student. Basic theory behind electrocardiography as well a interpretation of basic EKG patterns. Common errors of taking and read ing EKGs. Identification of common normal and abnormal wave pattern on EKGs. Value and appropriate use of echocardiography and phono cardiography. Principles of performing simple exercise tolerance testing

151 **Clinical Pharmacology** (arr.) Staf

Day-to-day clinical situations for discussion of the appropriate use o some of the more common drugs in a primary care practice. Dosages actions, routes of administration, indications, and contraindications a applied to specific clinical examples. Advantages, disadvantages, and reasons for deciding on the primary drug and possible alternative therapy When and how to use *PDR*. Review and discussion of the importance and advantages of taking an accurate and complete drug history. Pre requisite: Phar 158. (Summer)

153 **Gynecology Outpatient: Nurse Practitioner** (arr.) Staf

Required rotation for nurse practitioner students. Management of gyne cological problems in ambulatory setting.

154 **Geriatric Practicum** (arr.) Johnson

Required rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

157 **Primary Care Preceptorship: Nurse Practitioner** (arr.) Staf

Six-week required rotation for nurse practitioner students. All aspects of patient management in ambulatory setting.

160 **Medical Inpatient** (5) Staf

Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the medical problems of a hospitalized patient. The student works on the medical ward with a patient care team under the supervision of the medical resident and/or attending physician. Initial patient evaluation data base (history, physical, appropriate diagnostic and therapeutic procedures) and assistance with inpatient management. Daily rounds with emphasis on the basic approach to diagnosis, treatment pathophysiology, and prevention of disease. The Problem Oriented Medical Record System is used. Attendance is required at all work

rounds, teaching rounds, noon conferences and grand rounds of the medical service. Students stand regular call status.

163 **Medical Outpatient** (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding various medical problems encountered in an ambulatory setting. Common ambulatory problems of both acute and chronic nature. The student is assigned to an ambulatory setting such as outpatient clinic, HMO, or community health center. New patients are evaluated with staff assistance and follow-up visits are supervised by the staff. Emphasis on differential diagnosis, utilization of ambulatory facilities, patient management, and preventive medicine.

165 **Medical Outpatient: Nurse Practitioner** (arr.) Staff

Rotation for nurse practitioner students, arranged with approval of advisor. Aspects of specialty patient management in ambulatory setting.

166 **Surgical Inpatient** (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information relating to the surgical patient. Students are given in-depth experience in the pre-operative and post-operative management of the surgical inpatient; they are taught to perform a pre-operative workup, make progress notes, and participate in operative procedures under close supervision of the surgical staff. The student is also expected to stand call. Attendance by the student at all surgical rounds is mandatory.

167 **Surgical and Emergency Medicine** (arr.) Staff

Same as HCS 178 except that length of course is variable. For off-campus students.

169 **Obstetrics and Gynecology** (arr.) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding the obstetrical and gynecological patient. Students work up and follow patients on the obstetrical and gynecological service, and assist in deliveries and gynecologic/obstetric procedures. Students attend all regularly scheduled obstetric and gynecologic ward rounds, conferences, and seminars conducted by the staff.

170 **Obstetrics: Nurse Practitioner** (arr.) Staff

Two-week elective rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

171 **Pediatric Outpatient: Nurse Practitioner** (arr.) Staff

Three-week rotation for nurse practitioner students. Ambulatory pediatric practice.

172 **Pediatric Outpatient** (arr.) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding medical problems of the pediatric outpatient. Students are assigned to a pediatric outpatient setting under the direction of a physician where they learn normal childhood development, history-taking, and physical examination of infants and children. The student also develops skills in the management of common childhood illnesses and in parental counseling.

Staff

174 **Primary Care** (5)

Required rotation for off-campus allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians.

Staff

175 **Primary Care Preceptorship** (arr.)

Required rotation for allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians.

Staff

178 **Emergency Medicine** (5)

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding the emergency patient. Students have rotation shifts to ensure maximum exposure to patient load and clinical experience. Opportunity to deal with a variety of acute life-threatening, traumatic, and psychiatric emergencies. Surgical and medical emergency management problems under the supervision of the emergency room physicians. Attendance is required at all applicable conferences.

Staff

179 **Emergency Medicine: Nurse Practitioner** (arr.)

Two-week rotation required for nurse practitioner students. Medical and surgical emergency management problems.

Staff

180 **Practicum in Environmental Health** (10)

Supervised fieldwork. Food service, housing, water, sewage and solid waste, and infectious diseases. Occupational health problems. Reports and conferences.

181–82 **Introduction to Environmental Science** (3–3)

Water: general characteristics (urban and rural), treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Recognition and control of environmental pollution. Treatment and disposal of human wastes. Food sanitation: processing, storage, and distribution. Effects of major pollutants on people. Radiological safety. For off-campus students.

183 **Introduction to Industrial Hygiene** (3)

Chemical hazards: diseases caused by chemical exposure, toxic dust, metal fumes and vapor, gases and organic compounds. Physical hazards: biological effects of low and high temperatures, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure and atmospheric pollution. For off-campus students.

184 **Public Health Organization and Administration** (3)

Public health activities and organization, philosophy, background, and development. Vital statistics, laboratory services, education, nursing, and social services. Administrative considerations, including governmental aspects, fiscal management, personnel factors, and public relations in public health organizations. For off-campus students.

185 **Environmental Impact and the Law** (3)

The rationale for environmental impact statements from the viewpoint of the nature and origins of the environmental crisis. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment. For off-campus students.

189 **Alcohol Rehabilitation Unit** (3)

Psychological and therapeutic approaches to care and rehabilitation of patients with alcohol-related disturbances. For off-campus students.

190 **Dermatology** (1)

Clinical assessment of common dermatologic conditions found in the ambulatory care setting. For off-campus students.

191 **Eye, Ear, Nose, and Throat** (3)

Diagnostic and therapeutic approaches to determining the prognosis and outcomes of disease of the eyes, ears, nose, and throat. For off-campus students.

192 **Orthopaedics** (3)

Diagnosis and treatment of common orthopaedic problems found in the primary care setting. For off-campus students.

193 **Issues in Aging** (3) Boren

Seminar on the nature and problems of aging, including social, biological, economic, legal, and health care needs. Guest lecturers include professors from several University schools and experts from affiliated institutions and the community. Designed primarily for graduate students in the social sciences and health care administration and for students in the medical school. (Fall and spring)

194 **Practicum in Gerontology and Geriatric Care** (arr.) Staff

Supervised fieldwork with the elderly or in administration and planning for the elderly. Offered in cooperation with other schools and departments of the University. For medical students and for undergraduate and graduate students in the social sciences and Health Services Administration. (Fall and spring)

196 **Issues in American Health Care** (arr.) Staff

Fieldwork combined with academic study of the present American health care system and its problems: cost, quality of care, delivery of care, ethical issues, health education, consumer issues. Field placements (12–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

197 **Current Topics in Bioethics** (1) Lynn

(Formerly Community Health Education)

Critical investigation of various areas of bioethics. Designed and presented by an all-campus faculty group that includes physicians, lawyers, economists, philosophers, and health care administrators.

198 **Psychiatry** (arr.) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding the psychiatric inpatient. Identification and management of psychiatric illness. Teaching rounds, small group seminars, and grand rounds provide instruction in psychopathology and treatment methods. As an integral part of the treatment team, the student participates in the care of the psychiatric patient, working closely with the faculty, learning to elicit information from the patient and his family, and interpreting findings.

199 **Independent Study** (arr.) Staff

Clinical rotation in area chosen by individual student. Objectives for chosen area determined before enrollment. Advisor's approval required for area of study and learning objectives.

201 **Practicum in Geriatric Care** (1) Boren, Pawlso

Clinical experience will include interviewing elderly persons (the initi assessment); observation of medical history taking and physical assessment and participation in a multidisciplinary case conference. (Fall an spring)

202 **Take Care of Yourself** (1) Boren, Snodgras

Interdisciplinary field experience working with the elderly. Weekly 1-hou seminars provide background for teams of medical and HKLS students t conduct classes at community-based settings which focus on health educa tion, physical fitness, dance/exercise, and methods of self-care. Student act as health advocates, aiming to foster improved physical, social, an emotional health for elderly persons. Students keep a record of activities and are required to submit a written report on their experience. (Fal and spring)

230 **Emergency Medicine I** (2)

Required course for first-year medical students. Didactic presentations b guest speakers on general principles in the pre-hospital care and handling of victims of accident and illness. Emphasis on pre-hospital management of typical emergencies. Patient assessment, cardio-pulmonary resuscita tion, bandaging and splinting, lifts and carries, intravenous therapy and parenteral drug administration. Opportunities to practice psychomotor skills and rescue techniques during regularly scheduled practicum ses sions. (Spring)

231 **Emergency Medicine II** (1)

Elective continuation of HCS 230. The student is expected to develop pro ficiency equivalent to that of an emergency medical technician. Opportu nities to spend time in the University Emergency Room and ride on either a basic life support ambulance or mobile intensive care unit with the in structor. After successful completion of Emergency Medicine I and II, the student is awarded an Emergency Medical Technician certificate by the University.

232 **Studying a Study and Testing a Test: How to Read Clinical Literature** (1) Riegelman

Basic principles for evaluating clinical studies and diagnostic tests. Clini cal flaw-catching exercises containing a variety of errors will be used as the basis for discussion.

301 **Clerkship in Primary Care** (10) Staf

Required for third-year medical students. Care of patients in ambulatory setting. Includes participation in University's prepaid health plan (HMO), emergency room, and office practice of general internists, general pediatri cians, and family practitioners. Emphasis on specialty skills which contrib ute to physician's capacity to care for common minor illnesses. Office practice of orthopaedics, otolaryngology, dermatology, and ophthalmology. Participation with District of Columbia Fire Department in responding to ambulance calls. Lecture series provides foundation for office management of common illnesses in ambulatory setting. 8-week elective periods through out the academic year.

350 **Ambulatory Health Care** (5) Pawlso

Research or clinical experience in primary medical care, including geri atric medicine. Participation in project relating to health care delivery

including medical audit, study of organization of health services, and problems of underserved (especially elderly) populations. Clinical experience will be arranged. Exchange with similar program in other institutions is possible, especially for those participating in model family practice units. 4-week elective periods.

351 **Biomedical Ethics** (5) Lynn and Associated Faculty

For senior medical students at Georgetown, Howard, Uniformed Services, and GWU. Subjects will be chosen from areas of current concern for the medical professions, including definition of health and disease, delineation of physician and patient role, research issues, especially the requirement for consent, choices in the allocation of scarce resources, health care systems organization and alternatives such as national health insurance, and rights of patients and providers. Aspects of history, law, economics, and sociology will be included. 4-week elective periods. (Spring)

359 **Emergency Health Care** (5) Shesser

Rotation in emergency medicine offered by the Division of Emergency Medicine. Supervision by the division's full-time faculty and house staff rotating through the division. Approximately 48 hours per week, with some night call. 4-week elective periods. GWU Hosp.

360 **Emergency Health Care** (5) Staff

Assignment to the Washington Hospital Center emergency room. Instruction by full-time and resident emergency room staff. Cardiopulmonary resuscitation and management of trauma, drug overdose, coma, and common illnesses and injuries in emergency care setting. 4-week elective periods.

361 **Family Practice Preceptorship** (5)

Students spend four to eight weeks in a family practice preceptorship in rural Garrett County, Maryland. Supervision is by board-certified family practitioners in the Garrett County Medical Center. The physicians are affiliated with the University of Maryland Family Practice Program of which this site is a part.

362 **Rural Family Practice Preceptorship** (5) Pawlson

Family health care in a small coal mining town in central West Virginia. The Somersville Hospital Family Practice Center includes facilities for outpatient, inpatient, and emergency services. Supervision is by three board-certified family practitioners. 4-week elective periods.

363 **Geriatric Medicine** (5) Pawlson

Clinical experience at congregate housing facility, outpatient practice, hospital home visits, and long-term care facility; opportunity to supplement experience with activity at senior centers and day care facilities. 4-week elective periods.

369 **Issues in Health Care** (1)

The focus of the course will be on the interface between the individual practitioner-patient interaction and the various forces of society which have a major impact on the practitioner and the patient. The contribution of law, ethics, economics, and government to the health care system will be introduced in lectures and panel discussions, and illustrated with case reports. Required for second-year medical students. (Fall)

370 **Mental Health Provision in the Primary Care Setting** (5) Shap
For senior medical students who seek clinical experience in a multi-dis
plinary mental health practice, with emphasis on the short-term treatm
of patients commonly presenting in a primary care setting. Students
exposed to such problems as sexual dysfunction, depression, and psych
somatic symptoms as they are presented in an ambulatory care settin
The student is given the opportunity to perform initial evaluations, d
serve groups, follow patients, and provide consultation to primary ca
teams. Limited to one student per session for a minimum 6-week elect
period.

390 **Extramural Health Care Sciences Elective** (arr.)
The department makes arrangements for students to spend one or mo
elective periods at other institutions. Approval of the department chair
man required.

Interdisciplinary Courses

First-year medical students are required to take Idis 212, *Neurobiology*, ad
ministered by the Departments of Anatomy and Physiology.

Staf

212 **Neurobiology** (3)
Same as Anat 212 and Phyl 212. Integrated survey of the structure and
function of the human nervous system; lecture, clinical demonstration
and laboratory.

Introduction to Clinical Sciences, an interdisciplinary program, is required of
medical students in the second year. By means of lectures, panel discussions,
seminars, case presentations, demonstrations, and examinations of patients, it
provides students with basic instruction in various clinical subjects and prepares
them professionally and personally for the clinical clerkships and career elec
tives in the third and fourth years. The program is under the direction of a
Coordinating Committee appointed by the Dean for Academic Affairs of the
School of Medicine and Health Sciences and formulated by the Second Year
Subcommittee of the Educational Planning Committee. The Coordinating Com
mittee consists of representatives from the departments responsible for teaching
courses in the program and medical students: Brendan Buckley, second-year
student; Ira Dosovitz, Department of Psychiatry and Behavioral Sciences;
Andrew Ladner, third-year student; Frank Miller, Department of Pathology;
Gregory Pawlson, Department of Health Care Sciences; Thomas Piemme, De
partment of Medicine *(Chairman of the Coordinating Committee)*; Jorge Rios,
Department of Medicine; Samuel Scott, Department of Medicine; Winfield
Scott, Dean's Office; and James Straw, Department of Pharmacology. In addi
tion to Idis 301 (see below), the program consists of Path 201, Phar 201, HCS
137, and Pschi 201.

Staf

301 **Introduction to Clinical Medicine** (16)
One-year course. Integrated, organ-oriented course, with an emphasis on
physical diagnosis. Fundamental instruction in child health and develop

ment, clinical problem solving, dermatology, gynecology, internal medicine (including sub-specialties), neurology, obstetrics, ophthalmology, psychiatry, radiology, and urology; hospital-based physical diagnosis and history-taking experience.

Medical and Public Affairs

Chairman: M. Head

Professors M. Head, D.J. Sharpe, E. Waters, Jr. *(Research)*
Associate Professor F.J. Kavanaugh *(Research)*

351 **Law and Medicine** (2) Sharpe, Head, Fiscina
Open to 2nd-year medical students. Problems arising when the professional interests of lawyers and physicians overlap. Malpractice, personal injury litigation, licensure and discipline, ethics and economics, hospitals and other institutions, and compelled treatment. (Spring)

Medicine

Chairman: J.C. Rios
Directors of Divisions: H.E. Ratcliffe *(Allergy)*, A.M. Ross *(Cardiology)*, A.L. Ginsberg *(Gastroenterology)*, L.S. Lessin *(Hermatology-Oncology)*, C.U. Tuazon *(Infectious Diseases)*, K. Wipplinger *(Internal Medicine)*, K.L. Becker *(Metabolic and Endocine Diseases)*, S.V. Spagnolo *(Pulmonary Diseases)*, I.G. Tamagna *(Rehabilitation Medicine)*, A.M. Thompson *(Renal Diseases)*, R.P. Jacobs *(Rheumatology)*

Professors J.M. Bacos, W.P. Baker, W.F. Barth, K.L. Becker, D.O. Castell, T.O. Cheng, J.A. Curtin, V.T. DeVita, M.L. Elgart, G.D. Eng, J.M. Evans, W.R. Felts, Jr., J.D. Finkelstein, W.P. Fortune, D.E. Hawkins, A.C. Hollinshead *(Research)*, I.I. Hsu, R.P. Kaufman, R.I. Keimowitz, P.D. Kind, N.C. Kramer, J.C. LaRosa, F. Leonard *(Research)*, L.S. Lessin, J. Lindsay, Jr., W.M. Lukash, D.S. O'Leary, A.E. Parrish, T.E. Piemme, L.E. Pierce, H.V. Pipberger, H.E. Ratcliffe, R.C. Reba, D. Reiss, J.C. Rios, M.J. Romansky, A.M. Ross, E.R. Simon, I.G. Tamagna, P. Witorsch, F.W. Wolff, H.J. Zimmerman
Adjunct Professors W.H. Crosby, T.E. Morgan, V.L. Nickel
Clinical Professors E. Adelson, A. Baer, S.H. Danovitch, H.D. Ecker, F.A. Ennis, F.A. Finnerty, Jr., M. Fuchs, R. Goldman, M. Gusack, H.L. Kamenetz, J.P. Keeve, G.A. Kelser, Jr., S.D. Loube, F.J. Murray, B. Nelson, E.P.

332 **Acting Internship in Medicine** (5) LaRoss

Responsibility at the intern level. Initial patient evaluation and diagnosis and therapeutic plans, writing all medical orders (which must be counter signed by an M.D.), coordinating patients' care, writing progress notes and dictating the discharge summary. Night call with the ward team. House staff conferences. 4-week periods.

333 **Acting Intern in Medicine** (5) Curtin

Under the supervision of the medical resident and attending physician, student works with a patient-care team on a medical ward, does initial evaluation, and presents patient's problem at attending rounds and appropriate teaching conferences. Subspecialty consultations also review patient's problem with the student. 4-week elective periods. Wash. Hosp. Center.

334 **Acting Intern in Medicine** (5) Finkelstein

Students assigned to a patient-care team under direct supervision of a University resident on general medical wards. Problem Oriented Medical Record System used. Students complete initial patient evaluation data base and are responsible for clinical management during hospitalization. They write all orders, which must be reviewed and co-signed by the resident, and are expected to present their patients at attending rounds and conferences. Close supervision and guidance by the team resident, attending physician, and subspecialty consultants. Interview required. 4-week elective periods. V.A. Hosp.

335 **Acting Intern in Medicine** (5) Wisneski

Responsibilities of intern. Similar to Med 332. 4-week elective periods. Holy Cross Hosp.

336 **Intensive Care Medicine** (5) Witorsch

4-week elective periods. Wash. Hosp. Center.

338 **Occupational and Environmental Medicine** (5) Chase

Students select a field setting in Washington area (AMTRAK, EPA, DC Fire/Police Depts., Navy Diving School, etc.) in which the effects of various occupational and environmental health hazards are addressed. Participation in administrative and clinical intervention is provided under direct physician's supervision. Emphasis on the relationship of occupational and environmental medicine to the practice of primary care. Travel opportunity to distant field sites is generally available. 4-week elective periods.

349 **Infectious Diseases** (5) Curtin and Levy

Clinical experience in infectious disease service. Daily work rounds including lab, conferences, Journal Club. 4-week elective periods. Wash. Hosp. Center.

350 **Clinical Infectious Diseases** (5) Parker

Introduction to the diagnosis and treatment of bacterial, viral, fungal, and mycobacterial infections. Students assume primary responsibility for infectious disease consultations in conjunction with Fellows, residents, and full-time faculty members. Clinical application of laboratory techniques used in the diagnosis and treatment of patients with infectious disease problems. Emphasis on the usefulness of rapid diagnostic techniques and pharmacology of antimicrobics. Students will participate fully in all the section's activities. 4-week elective periods. V.A. Hosp.

351 **Clinical Infectious Diseases** (5) Tuazon

Clinically relevant aspects of microbiology and immunology; relevant aspects of patient history, physical and laboratory examinations. Students will learn to do infectious disease consultations and to use antibiotics intelligently. Minimum 4-week clinical rotation. Students electing a longer time period will assist with research project in infections in drug abusers, staphylococcal infections (especially endocarditis), clinical pharmacology of gentamicin or mechanisms of immunity in sickle cell anemia patients. Univ. Clinic.

352 **Clinical Cardiology** (5) Hsu and Staff

Designed to provide experience in ambulatory and hospitalized patient care, ECGs, graphics, CCU, exercise lab; observation in cath lab. 4-week elective periods.

353 **Clinical Cardiology** (10) Manchester

Observation of and participation in the diagnosis and clinical management of cardiovascular disorders. Acquaintance with physical signs of heart disease. Exposure to noninvasive diagnostic procedures, echo-, phono-, apex-cardiography; interpretation of electrocardiograms and chest x-rays; ward rounds in intensive coronary care unit. 8-week elective periods.

354 **Preceptorship in Cardiology** (5) Ross

Placement with practicing cardiologists in office and hospital settings. 4-week elective periods.

355 **Intensive Care/Coronary Care/Critical Care** (arr.) Haider

Student is assigned to a five-bed coronary care unit, a six-bed separate medical/surgical intensive care unit, and a 12-bed critical care unit and works with a senior resident assigned to these units. He/she works up all admitted patients; makes rounds with teaching physicians on a daily basis; assists in the care of critically ill patients and those with suspected myocardial infarction or cardiac arrhythmias; assists in the performance of various procedures including electrocardioversion, pacemaker insertion, and Swans Ganz' catheter insertion. The student is responsible for all orders under resident and attending supervision and follows patients when they move to intermediate care beds on the second floor. 4- or 6-week elective periods. Providence Hosp.

356 **Cardiovascular Diseases** (5) Haider

Assignment to a group of patients with non-emergent cardiac problems and to a resident. Rounds are made three times weekly. Weekly teaching conferences with members of the Cardiology staff. The student will provide day-to-day care of patients with cardiovascular problems, including hypertension, congestive heart failure, and valvular and pericardial diseases, and will observe diagnostic studies, including exercise stress testing, echocardiography, and electrocardiograph interpretation. 4-week elective periods. Providence Hosp.

358 **Clinical Cardiology—Washington Hospital Center** (5) Mendelson, Bacos, Lindsay, Goldstein

Active participation in the clinical cardiology service of Washington Hospital Center. Bedside evaluation correlated with electrocardiography and other diagnostic studies, including stress testing, phonocardiography, echocardiography, cardiac catheterization, nuclide angiography, etc. 4-week elective periods. Wash. Hosp. Center.

359 **Coronary Care Unit—Washington Hospital Center** (5) Mendelson, Bacc Lindsay, Goldstei

Active participation in the care of patients on the coronary care unit Washington Hospital Center. The student works closely with house staf and attending staff. Emphasis on diagnosis and treatment of coronar disease, complications of infarction, diagnosis and treatment of arrhyth mias, and selection of patients for surgical intervention. 4-week elective periods. Wash. Hosp. Center.

360 **Clinical Cardiology** (5) Fletcher*

Experience in clinical cardiovascular problems under supervision of car diology staff. Emphasis on history, physical diagnosis, and noninvasive cardiovascular techniques. Role of cardiac catheterization explained and results in specific cases discussed. Electrocardiography covered as one of the tools used to approach the cardiovascular patient. Patient manage ment is integral part of course. Teaching rounds and conferences. 4-week elective periods. V.A. Hosp.

361 **Cardiology—NIH** (5) Rosing

Broad exposure to all aspects of congenital and acquired cardiac disease. Participation in diagnostic and therapeutic work-up of patients, and evalu ation of acute and long-term effects of medical and surgical interventions. 4-week elective periods.

363 **Cardiac and Medical Intensive Care—V.A. Hospital** (5) Saunders†

For students interested in acute medicine. Night call every third night. Students participate in all aspects of coronary and medical intensive care, becoming familiar with diagnostic and therapeutic techniques used on this unit: mechanical ventilation, right heart catheterization and central hemo dynamic monitoring, temporary pacemakers, intra-aortic balloon counter pulsation, cardiac rhythm monitoring, and new drugs. The student has the opportunity, under close supervision, to manage a spectrum of other non-cardiac medical emergencies. 4-week elective periods.

364 **Cardiovascular Data Processing** (5) Pipberger

Study of a variety of modern computer techniques; primary research in computer analysis of electrocardiograms. 4-week elective periods. V.A. Hosp.

365 **Clinical Electrocardiography and ECG Computer Analysis** (5 or 10) Pipberger

Participation in daily computer processing and analysis of electrocardio grams from the V.A. Hospital. ECG findings are correlated with clinical data from all problem cases. Daily review sessions with section chief and cardiac fellows. Participation in seminars and a journal club. 4- or 8-week elective periods. V.A. Hosp.

370 **Endocrinology** (5 or 8) El-Hodary

Assignment as an acting intern to work with a second- or third-year resident. Consultations of the general medical service on patients with endocrine problems. Rounds are made on a daily basis, and a weekly teaching conference is held to discuss endocrine problems in depth. Op portunity to attend teaching duties at D.C. General Hospital. In-depth evaluation of patients with endocrine problems, as well as emergency care

* Dr. Fletcher is Chief of Cardiology at the Veterans Administration Hospital.
† Dr. Saunders is Assistant Chief of Medicine for Intensive Care at the Veterans Administration Hospital.

of patients admitted to medical floors and intensive care unit for serious life-threatening endocrine emergencies. Night call is approximately every third night (optional). 4- or 6-week elective periods.

371 **Endocrinology** (5) Gaskin

Student evaluates patients referred to the endocrinology service, takes part in planning diagnostic work-ups and therapy, and is responsible for case presentations and follow-up of those patients. Clinical rounds are held daily, and endocrine clinic and diabetic clinic are held weekly. Weekly endocrine conference includes Journal Club once a month and pediatric endocrinology once a month. Rounds and conferences at the V.A. and at G.W. Hospitals are also included when possible. Assigned reading is reviewed daily. 4-week elective periods.

373 **Endocrinology and Metabolism** (5) Becker

Clinical experience in endocrinology and metabolism. Students examine endocrine patients, make preliminary diagnoses, and assist in treatment. Clinical rounds daily; weekly endocrine clinic, diabetic clinic, and Journal Club participation; laboratory and research experience available. 4-week elective periods. V.A. Hosp.

375 **Endocrinology Research** (10) Becker and Staff

Participation in endocrinology and metabolism research laboratory. Introduction to chemical and technical aspects of endocrine research. Participation in ongoing research activities. Students learn appropriate procedures, such as radioimmunoassay of hormones, histopathologic techniques, atomic absorption spectrophotometry, and investigative approach to solving research problems. Prior interview with instructor suggested. 8-week elective periods.

376 **Metabolic Disorders in Diabetes** (5) Penhos

Intensive and practical studies of the technique to examine surgical, chemical, and hormonal diabetes. Participation in research on carbohydrate, protein, and lipid metabolism, insulin secretion in isolated organ perfusions. Seminars and participation in Journal Club; discussions on the results obtained. 4-week elective periods.

381 **Research in Endocrinology** (5) Penhos

Participation in endocrine research, including laboratory experience, experimental surgery, biochemical methods, and *in vivo* and *in vitro* endocrine studies. Weekly seminars and discussions correlate experimental results with clinical observations. 4-week elective periods. V.A. Hosp.

390 **Extramural Internal Medicine Elective** (arr.)

The department will permit students to spend elective periods at other institutions. Interested students should contact the department chairman.

391 **Clinical Oncology** (5) Cohen

Participation in clinical management of patients with carcinoma on the Nat'l Cancer Institute-V.A. Med. Cntr. oncology ward. 4-week elective periods. V.A. Hosp.

393 **Medical Oncology** (10) Young

Current methods of evaluation and treatment of lymphomas, Hodgkin's disease, testicular tumors, ovarian, breast, and other malignancies, including a view of the broad spectrum of these diseases. Participation in patient care and review of clinical trials. Procedures such as bone marrows, liver biopsies, and other staging techniques. 8-week elective periods.

402 **Research in Cancer Immunology** (10) Hollinsh

Laboratory experience with tests used to correlate cellular anti-tumor activity to solid tumors with the clinical course of the disease; experime to investigate viral etiology of certain forms of cancer; study of fetal a gens and role in oncogenesis; cell membrane antigens specific for leuke 8-week elective periods. Ross Hall.

412 **Clinical Gastroenterology** (5) Dan

Work in a suburban office devoted to private partnership practice of ternal medicine with emphasis on gastroenterology. Hospital rounds, ev uation of problems, discussion with attending physician and patient diagnosis and therapy, observation of and assistance in specialized pr cedures, practical aspects of office management. 4-week elective periods.

413 **Clinical Gastroenterology-Hepatology** (5) Dobb

Intensive clinical experience with patients who have digestive diseases, cluding those of the gastrointestinal tract, liver, and pancreas. Patie consultations, teaching rounds, seminars. Joint conferences with surger pathology, and radiology staffs emphasize multidisciplinary approach digestive diseases. 4-week elective periods. Univ. Clinic.

414 **Clinical Gastroenterology-Hepatology** (5) Se

Students work closely with Fellows in the gastroenterology/hepatolog section, seeing patients on consultations and being involved in the initi evaluation, patient investigation, and follow-up. Close supervision is a forded by both the senior Fellows and senior staff. Direct or indirect pa ticipation in all specialized procedures involving various biopsy tech niques and endoscopies. Teaching rounds, conferences, and seminars. 4 week elective periods. V.A. Hosp.

415 **Clinical Gastroenterology** (5) Gol

Course includes direct patient contact on a consultative basis, and partic pation in all section activities, including reviews of gastrointestinal pathol ogy and radiology for individual patients, and all procedures, particularly endoscopic. The student will be expected to develop a fundamental com knowledge of basic gastroenterology and to participate in a journal activ ty, and may be called upon to participate in a case presentation at month ly joint GI Grand Round sessions. 4-week elective periods. Wash. Hosp Center.

416 **Gastroenterology—D.C. General Hospital** (5) Postow, Rudi

Clinical gastroenterology. Participation in the daily activities: ward rounds with Fellows and attending physicians, endoscopic procedures (performe twice a week), Journal Club, GI medical-surgical conference, teaching conferences, and weekly clinic session. Direct responsibility for a number of consultations under the supervision of the GI Fellows. 4-week elective periods.

423 **Clinical Gastroenterology** (5) Trujillo, O'Kief

Introduction to clinical problems in diagnosis and treatment of gastroen terology in both office and hospital practice. Peritoneoscopy, endoscopy and biopsies. 4-week elective periods. Univ. Hosp.

426 **Research in Metabolism of Sulphur Amino Acids** (15) Finkelstei

Study of methionine metabolism in mammalian tissues using several re search techniques: kinetic properties of purified enzymes; induction and repression of enzymes by hormones and diet; metabolism of methionine

in the isolated perfused rat liver. Projects available in any of the above areas and will be developed further to meet student needs. 12-week elective periods. V.A. Hosp.

430 **Clinical Hematology** (5) Schechter* and Staff

Participation in the evaluation and treatment of patients with hematological disorders. Ward rounds, morphology review sessions, participation in hematology clinic and Journal Club. 4-week elective periods. V.A. Hosp.

431 **Clinical Hematology and Oncology** (5) Lessin and Staff

Immersion in the process of diagnosis and therapy of hematologic and oncologic disorders, including in-patient and out-patient consultations, daily care, and follow-up of clinical hematologic and oncologic problems. Emphasis on blood and marrow morphology, tumor pathobiology and modern hematologic-oncologic diagnostic procedures. 4-week elective periods.

432 **Clinical Hematology** (5) Pierce

Clinical evaluation of in-patients and out-patients with symptoms referrable to the myelopoietic system using bedside and laboratory investigative parameters. 4-week elective periods. Wash. Hosp. Center.

433 **Hematology** (5) Rheingold

Observation of and participation in diagnosis and treatment of patients with hematologic disorders, in office (and hospital) setting. 4-week elective periods.

434 **Hematology-Oncology** (5 or 8) Pushkas

Assignment with senior resident seeing all patients with hematologic and tumor problems for whom consultation is requested. Interpretation of blood smears and blood coagulation studies. Assist in performance and interpretation of bone marrow examinations. 4- or 6-week elective periods. Providence Hosp.

436 **Hematology Research** (10 or 15) Schechter* and Staff

Research interests of the staff include lymphocyte biology and platelet production and hemostasis. Facilities available to do *in vitro* culture of human peripheral blood and bone marrow, radioisotopic studies, and electron microscopy. 8- or 12-week elective periods.

440 **Pulmonary Medicine** (5) Spagnolo

Participation in the diagnosis and therapy of patients with pulmonary disease; introduction to the management of patients with acute respiratory failure. Daily ward rounds, chest roentgenology review sessions, participation in Journal Club and physiology conference. Emphasis is placed on acquainting the student with modern pulmonary diagnostic procedures and current literature. 4-week elective periods. V.A. Hosp.

441 **Pulmonary Disease** (5 or 8) Weiss

Responsibility for the care of patients admitted with pulmonary problems as well as performing consultations on patients on other services. Daily rounds and a weekly teaching conference. Weekly pulmonary physiology conference in which arterial blood gases, pulmonary function testing, and principles of respiratory care are discussed in depth. Consultation services and daily care of a small number of in-patients. Exposure to such procedures as pleural biopsy, thoracentesis, lung needle biopsies, and arterial

* Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.

puncture. Involvement on a consulting basis with all patients in the int
sive care unit with acute respiratory problems. 4- or 6-week elective
riods. Providence Hosp.

442 **Pulmonary Diseases** (5) Witors
Performance and interpretation of pulmonary function studies, includi
ventilatory, diffusing capacity, and blood gas analysis; daily teachi
rounds and supervised consultation on patients with various pulmona
and infectious diseases. Participation in pulmonary clinic; techniques a
principles of inhalation therapy. Principles of and experience with re
piratory failure and respiratory intensive care. 4-week elective period
Wash. Hosp. Center.

447 **Pulmonary Medicine** (5) Delaney, Spagnol
Participation in the diagnosis and therapy of patients with pulmonary di
orders. Ward rounds, chest roentgenology sessions, and participation i
Journal Club. Emphasis on acquainting the student with modern diagno
tic procedures related to patients with pulmonary diseases and current li
erature. 4-week elective periods. Univ. Hosp.

449 **Primary Care Elective** (5) Arlin
Students assigned to European-trained family practitioner in small tow
on a Bahamian out-island. Caring for patients with medical, surgical
pediatric, obstetrical-gynecological, psychiatric, and tropical disease prob
lems. Students responsible for their own transportation. 4-week rotations
Open to two students each period.

450 **Rheumatology Research** (10) Jacob
Participation in on-going clinical and laboratory research projects in the
Division of Rheumatology. Major areas of research interest include meth
ods of early diagnosis of septic arthritis, animal models of inflammatory
joint disease, and alterations of collagen in degenerative and inflammatory
arthropathies. 8-week elective periods. Univ. Clinic.

451 **Arthritis and Rheumatic Diseases** (5) Felts, Jacobs, Borenstein
Participation in the evaluation and treatment of patients with rheumatic
diseases, including in-patient and out-patient consultations, daily care and
follow-up, and clinical conferences. Regular discussions of selected topics
in rheumatology, emphasizing differential diagnosis, pathophysiology, and
therapeutic modalities. 4-week elective periods.

452 **Clinical Rheumatology** (5) Nachel
Active participation in the work-up and management of in-patients and
clinic patients with rheumatic diseases. History, physical examination,
differential diagnosis, immunological mechanism, x-ray reading, and use
of laboratory tests will be stressed. 4-week elective periods. V.A. Hosp.

453 **Introduction to Arthritis** (5) Barth
Work-up, rounds, clinic, and consultations on patients with arthritis and
rheumatic diseases. Daily discussions on selected topics in rheumatology,
including clinical immunology, major disease categories (SLE, RA, gout,
etc.), differential diagnosis, drug therapy, serological reactions, x-ray
changes. 4-week elective periods. Wash. Hosp. Center.

455 **Rehabilitation Medicine** (5) Chiu, Enders
Management of 1-3 patients on the rehabilitation in-patient service under
supervision. Initial medical and neurological work-up, setting of goals,

and participation in team conferences. Out-patient work will include the use of electromyography and the neuromuscular examination as diagnostic tools, as well as management of common musculoskeletal conditions. Rounds and teaching activities. 4-week elective periods.

460 **Renal and Electrolyte Disorders** (5) Berkman

Participation in consultations, rounds, and out-patient clinic on patients with renal and electrolyte abnormalities; follow-up of patients. Examination of the urinary sediment, peritoneal, and hemodialysis. Conferences, reading assignments, ward rounds, participation in Journal Club. 4-week elective periods.

461 **Clinical Renal Disease** (5) Parrish

Participation in clinical and laboratory procedures used in the study of renal disease. Ward rounds, consultations, conferences, seminars. 4-week elective periods. Univ. Hosp.

463 **Clinical Application of Tissue Immunology** (5) Kramer

Application of immunologic methods to the study of human hypersensitivity states and metabolic diseases; study of serum proteins, including protein hormones and enzymes; research principles and methods; tissue typing and flourescent antibody methods. 4-week elective periods. Univ. Hosp.

465 **Renal Diseases and Fluid and Electrolyte Problems** (5) Jacobson

Participation in office and hospital consultations; care of patients with renal diseases and fluid and electrolyte problems. Familiarization with a variety of renal problems; work-ups of patients with renal disease; evaluation of renal function studies. Emphasis on critical use of medical literature. 4-week elective periods.

469 **Clinical Renal Disease** (5) Shalhoub*

Broad exposure to and active participation in all the clinical activities of the renal section, including consultations, hemodialysis, outpatient clinic, rounds, conferences, and Journal Club meetings. 4-week elective periods. Time period must first be cleared through instructor's office. V.A. Hosp.

470 **Allergy Clinic** (5) Ratcliffe, Werth

Lectures, conferences, and attendance at allergy clinic where both adult and child patients are seen. Detailed history-taking, physical examination, and skin-testing techniques. The student will have the option of dealing in depth with an individual patient to learn more about the wide ramifications of severe allergic disease. Discussion of each case with an allergist and development of complete management program. 4-week elective periods. Univ. Clinic.

471 **Allergy Clinic** (5) Evans, Summers

Lectures, conferences, and attendance at the allergy clinic where both adult and child patients are seen. Detailed history-taking, physical examination, and skin-testing techniques. Discussion of each case with an allergist to develop a complete management program. Emphasis on clinical aspects of immunology. 4-week elective periods. Walter Reed Hosp.

472 **Private Office Practice of Allergy** (5) Barr

4-week elective period.

* Dr. Shalhoub is Chief of the Renal Section at the Veterans Administration Hospital.

483 **Nuclear Medicine and Ultrasound** (5 or 10) Sauerbrun

Introduction to radioisotope methodology and ultrasound techniques applied to diagnosis in medicine. Interrelation and complementary use both modalities in evaluating the patient who presents with a diagnos problem. 4- or 8-week elective periods.

495 **Oncology Review** (5) Hollinshe

Each student is assigned a carefully selected reading list on one form cancer. Fundamentals, basic research, and latest clinical approaches a discussed in detail. Each student will write and illustrate a review of h or her subject. Interested students are encouraged to undertake their ow research project the following summer. 4-week elective period.

Microbiology

Chairman: L.F. Affronti

Professors L.F. Affronti, K. Huang, R. Hugh, P.D. Kind, E.M. Lerner II *(Research)*, M. Reich

Associate Professors Y. Chu *(Research)*, C.V. Reich *(Research)*, G.V. Stokes

Adjunct Associate Professor J.D. MacLowry

Associate Professorial Lecturer R.D. Donnelly

Assistant Professors B.T. Backus *(Research)*, G.E. Wagner

Adjunct Assistant Professors J.R. Baranski, C.E. Piper

Staff

128 **Microbiology for New Health Practitioners** (2)

Lecture course for students in allied health program. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.

129 **Immunology: Introduction to Immunologic Fundamentals** (3) Affronti, Silver

Lecture course for medical technology class; open to others. Fundamental immunologic concepts. Serologic and immunologic procedures as applied to clinical and research situations. Prerequisites: an introductory microbiology course and chemistry (inorganic and organic), or permission of instructor. (Spring)

Staff

†201 **Medical Microbiology** (8)

For medical students; open to qualified graduate students with permission. Bacteria, rickettsiae, viruses, yeasts, molds, protozoa, metazoa, and immunological concepts which relate to the health and disease of humans —cultural studies, methods of diagnosis, theories. Laboratory fee for nonmedical students, $20. (Spring)

Staff

211 **Microbiology** (4)

For graduate students. Bacteria viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc

* Dr. Sauerbrunn is Chief of Nuclear Medicine at the Veterans Administration Hospital.

† Required for medical students.

221–22, or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

212 **Pathogenic Bacteriology** (3) Hugh

Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial disease of man. Prerequisite: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 **Tissue Cell Culture and Somatic Variation** (3) Piper

Techniques of tissue culture and means of studying somatic variations. Prerequisite: Micr 211 or equivalent. (Spring)

215 **Medical Parasitology** (2) Baranski

For graduate students; open to medical students. Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 **Scientific Writing** (1) Wagner

Provides basis for preparing theses, dissertations, and publications. (Fall)

223 **Antimicrobial Chemotherapy** (1) Affronti, Reich

For medical students. Lecture course. Selection, clinical applications, and mechanism of action of various drugs and antibiotics used in the treatment of microbial infections. Members of the clinical faculty discuss relevant aspects of clinical chemotherapy. Prerequisite: Micr 201. (Fall)

225 **Microbial Physiology I** (3) Reich, Affronti

Morphology and biochemistry of various microorganisms with emphasis on bacteria. Prerequisite: Bioc 201 or 221–22; Micr 211 or equivalent. (Fall)

226 **Microbial Physiology II** (3) Reich, De Giovanni-Donnelly

Effects of physical and chemical agents on microorganisms with emphasis on antibiotics. Prerequisite: Micr 225 or permission of instructor. (Spring)

229 **Immunology** (3) Kind, Affronti

Lecture course. Fundamental immunologic concepts. Lectures will cover antigens, antibodies, antigen-antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor.

230 **Immunology Laboratory** (2) Kind, Affronti

Serologic and immunologic procedures as applied to clinical and research situations emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind

Lecture course. Study of immunological functions of reticulo-endothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Members of the clinical faculty discuss relevant aspects of immunobiology. For medical students; open to graduate students with permission of instructor.

233 **Virology** (3) Stokes

Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) Stokes

Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hug

History of bacterial classification, international rules of nomenclature applied to bacteria, development of bacterial classification based on relationships, survey of characteristics of bacterial groups. Prerequisite: Micr 201 or 212 or equivalent. (Fall, odd years)

251 **Clinical Laboratory Bacteriology** (3) Hug

For graduate students; open to medical students. Detection and identification of bacterial agents which cause diseases in humans. Comparative isolation and identification methods; emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 201 or equivalent. (Fall, even years)

252 **Medical Protozoology** (1) Baranski

For medical students; open to graduate students. Lecture and laboratory course. Clinical recognition of important protozoal parasites in medicine. Disease, its pathology, symptomatology, diagnosis, treatment, and prevention. (Fall)

253 **Medical Helminthology** (1) Baranski

For medical students; open to graduate students. Lecture and laboratory course. Clinical recognition of important parasitic worms in medicine. Disease, its pathology, symptomatology, diagnosis, treatment and prevention. (Fall)

254 **Malariology** (1) Baranski

For medical students; open to graduate students. Lecture and laboratory course. Clinical, laboratory, and epidemiological factors in malarial diseases in humans. Pathogenesis, symptomatology, clinical, and laboratory diagnosis. (Fall)

255 **Clinical Virology** (1) Huang

Primarily elective course for medical students; open to graduate students. General principles of virology; emphasis on clinical situations. Prerequisite: Micr 201 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti

Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laboratory fee for nonmedical students, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly

Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 **Cellular Immunology** (1) Kind

Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 **Seminar: Microbiology** (1–1) Staff

Required of graduate students. (Academic year)

280 **Virology** (10) Huang

Selected problems, library assignments, laboratory studies. 8-week elective periods.

281 **Biological Basis of Infections** (5) Affronti, Reich
Selected problems, library assignments, laboratory studies, term paper. 4-week elective periods.

282 **Immunology** (5) Kind, Affronti
Selected problems, library assignments, laboratory studies, term paper. 4-week elective periods.

283 **Bacteriology** (10) Hugh
Selected problems, library assignments, laboratory studies, term paper. 8-week elective periods.

289 **Inflammation, Immunity, and Hypersensitivity** (5) Affronti, Kind
4-week elective periods.

290 **Extramural Microbiology Elective** (arr.)
The department arranges for medical students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Neurological Surgery

Chairman: H.V. Rizzoli

Professors J.J. Bernstein *(Research)*, A.I. Kobrine, T.H. Milhorat, H.V. Rizzoli
Clinical Professors M.G. Alper, H.H. Ammerman, G. Dichiro, G.J. Hayes, N.H. Horwitz, C.L. Li, A.K. Ommaya
Professorial Lecturers V.W. Armbrustmacher, K.M. Earle, P.L. Kornblith, D.A. Ruge
Associate Professors C.B. Early, D.E. Evans
Associate Clinical Professors F.D. Cooney, A.P. Hustead, W.E. Lawrinson, E.U. Mannarino, J.P. Murphy

Assistant Professors I.S. Baron-Starke, M.K. Hammock, S. Koulouris

Assistant Clinical Professors B.J. Ammerman, J.W. Barrett, E.B. Byrd, C.P. Carroll, M.W. Dennis, J.R. Howe, J. Kushner, F.T. Schwartz

Clinical Instructors K. Ghaemi, B. Stopak

302 **Clinical Clerkship in Neurosurgery** (3)

2-week elective periods. Univ. Hosp.

380 **Clinical Neurosurgery** (5)

Clinical clerkship in neurosurgical service. Emphasis on neurologic examination; indications for special neurologic and operative procedures. 4-week elective periods. Med. Fac. Assoc.

382 **Clinical Neurosurgery** (5)

Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. 4-week elective periods. Nat'l Naval Med. Center.

383 **Pediatric Neurosurgery** (5)

Participation in all departmental activities: ward rounds, daily conferences, radiographic and pathologic studies, operating room procedures. 4-week elective periods. Children's Hosp.

387 **Clinical Neurosurgery** (5)

Participation in all departmental activities, including ward rounds, daily conferences, radiographic and pathologic studies, and operating room procedures. 4-week elective periods. Wash. Hosp. Center.

390 **Extramural Neurosurgery Elective** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

Neurology

Chairman: G.F. Molinari

Director of Encephalographic Laboratory: A. Racy

Professors V.H. Askanas *(Research)*, C.K. Conners *(Research)*, D.O. Davis, H.H. Hess, G.F. Molinari, S. O'Reilly, S.A. Shelburne, Jr.

Adjunct Professor D.E. McFarlin

Clinical Professor W.K. Engel

Professorial Lecturer N.P. Goldstein

Associate Professors A.B. Barnet, R.A. Lavine, M.M. Platt, P.F. Teychenne

Associate Clinical Professors K. Abraham, D.J. Fishman, A.J. Levens, N.C. Myrianthopoulos, K.B. Nelson

Assistant Professors C.S. Chang, A. Racy

Assistant Clinical Professors F.H. Anderson, V.J. Blazina, M.M. Davis, V.A. Duggins, R.N. Edelson, G.P. Gabe, J.F. Grim, J.E. Hogg, M.C. Korengold,

R. Kratz, R. Laureno, W.E. Lightfoote II, N.A. Luban, W.E. Lux, Jr., G.M. McCullars, J.F. Morales, L.K. Ng, M.A. Osborn, K.C. Rickler, D. Satinsky, H.M. Silby, E.C. Wilner

Adjunct Instructor M.E. Archutowska-Kempka

Clinical Instructors H.S. Mickel, H.T. Vollero, J.R. Wittenborn, Jr.

380 **Clinical Neurology** (5) Molinari and Staff

Emphasis on neurologic examination; indications for special neurologic tests, e.g., arteriograms, pneumoencephalograms. 4-week elective periods. Univ. Hosp.

383 **Clinical Neurology** (5) Huott

Emphasis on neurological examination and basic sciences, including neuroanatomy, as applied to clinical material. 4-week elective periods. Walter Reed Gen. Hosp.

384 **Clinical Neurology** (5) Laureno, Staff

Clerkship in neurology. Participation in neurology consultation service, clinic, and seminars. In-depth research for formal seminar presentation. 4-week elective periods. Wash. Hosp. Center.

390 **Extramural Neurology Elective** (arr.)

Students electing clerkships at the University Hospital can spend another elective period in another institution. They should arrange the elective with the other institution and bring a letter of acceptance to the chairman of the department of neurology for approval. The student is responsible for reporting the grade received to the department of neurology, which in turn will submit it to the Associate Dean for Student Affairs and Admissions.

Obstetrics and Gynecology

Chairman: A.B. Weingold

Professors R.H. Barter, J.B. Craft, Jr., S.E. Fabro, L. McGowan, C.C. Rogers, J.D. Schulman, J.G. Sites, B. Waxman, A.B. Weingold

Clinical Professors S.M. Belinsky, W.H. Cooper, O.I. Dodek, Jr., H.A. Donald, M.P. Footer, J.M. Friedman, J.M. Grodin, H.L. Kotz, W.P. McKelway, W.E. Patow, J.W. Pearson, Jr., N.J. Price, E.W. Titus, Jr., T.A. Wilson

Professorial Lecturers L.M. Hellman, D.H. Kushner, J.L. Sever, J.B. Sheffery

Associate Professors M.C. Edwards, J.H. Grossman III, J.W. Larsen, Jr.

Associate Clinical Professors A.A. Becker, J.M. Close, S.D. Cooley, E.A. Crisp, E.E. Gahres, C.R.A. Gilbert, H. Klaus, J.J. Kuhn, W.T. Lady, S.H. Lipsius, L.M. Liverett, S.C. Marinoff, D.H. Martin, L.Q. Pugsley, A.I. Robins, M. Rosenbaum, I.W. Rovner, J. Sacks, P. Soyster, S.F. Stewart, Jr., N.M. Tart, H.P. Treichler, J.C. Walsh, Jr.

Assistant Professors M.A. Fletcher, A.J. Friedman, J.L. Marlow, R.J. Stillman

Assistant Clinical Professors R.E. Badwey, B.A. Band, H.C. Beaver, J.
Berryman, K. Bis, D.R. Carlson, E.C. Cartwright, W.D. Cooper, A.A.
Moya, S.J. Dispenza, Jr., R.V. Erkenbeck, L.E. Fettig, J. Fogel, S.P. Ga
ner, C.S. Greenhouse, T.H. Gresinger, A.J. Heintze, V.B. Hugh, M.
Jerome, S.R. Johnson, E.G. Koch, I. Kogan, E.R. Kolvereid, A.I. Lao, A.
Lazarus, S.T. Lee, R.H. Levitt, J.W. Lyles, R.S. Margolis, D.M. Margulie
L.A. Martel, R.J. Orleans, J.C. Pan, W.R. Perkins, W.F. Peterson, L.
Radice, M.J. Roberts, M.W. Sandmeyer, Jr., C.I. Schneiderman, S.H. She
J.C. Skilling, G. Speck, C.E. Townsend, A.M.L. Van Rooy, C.L. Wagstaff
W.D. Wallace, Jr., A.W. Winshel

Assistant Professorial Lecturers J.C. Bulger, A. Kramm

Clinical Instructors J.E. Alarcon, B.L. Ames, J.E. Anderson, E. Atiemo, J.C.
Bolan, P.A. Bryce, R.L. Castle, D.C. Cinnamon, T.A. Cook, Jr., P.D.
Cowell, E.E. Cunningham, K.A. De Sandies, B.G. Douglas, J.J. Emery, C.M.
Ezekwueche, M.I. Fialco, J.B. Greenberg, A.A. Greenfield, F. Hirsch, S.
Horwitz, C.M. Jackson, C. Kim, B.A. Kleinman, M.K. Kowalski, J.H. Lan
K.H. Neblett, C.O. Okehi, O.S. Oredein, R.J. Pierce, P.K. Rattan, R.C.
Rigor-Matory, S.G. Roberts, L.A. Rosen, M.A. Ross, R. Rosser, Jr., B.S.
Rothman, J.E. Safran, S.A. Schlosser, T.W. Scott, H.N. Smith, M. Vatin
L.J. Whitby-Birckhead

Special Lecturers R.T. Greenfield, T.E. Schmitt

Staf

***303 Clinical Obstetrics and Gynecology** (10)

Participation in all obstetrical and gynecological clinics, daily departmenta conferences and ward rounds at University, Fairfax, and Columbi Hospitals. Manikin demonstrations of mechanism of labor and variou types of operative delivery. (8-week periods throughout academic year

Waxman

375 Family Planning and Contraception (5)

Participation in the department's family planning clinics at the Medica Center and Southeast Neighborhood Clinic, with some office practice and gynecologic screening practices. 4-week elective periods.

McGowan

376 Gynecologic Oncology (5)

Participation in all aspects of clinical in-patient and office diagnosis and treatment of women with gynecologic cancer. Related research. 4-week elective periods. Med. Fac. Assoc.

Fabro, Larson

377 Cytogenetics and Prenatal Diagnosis of Birth Defects (5)

Study and participation in research on the chemical aspect of diagnosis and prevention of birth defects. Patient screening for genetic defect, ul trasonography, and amniocentesis. 4-week elective periods.

Stillman

378 Reproductive Endocrinology (5)

Participation in patient management of infertility, encompassing infer tility work-up, operative diagnostic and threapeutic procedures, and man agement of gynecologic endocrine and infertility problems. 4-week elective periods.

Grossman

379 Perinatal Infectious Diseases (10)

Study and participation in research in infectious diseases of pregnancy and the intrapartum period. 8-week elective periods.

* Required for medical students.

380 **Clinical Obstetrics and Gynecology** (5) Gahres, Radice, Rothman
Participation in patient care, clinics, surgery, and delivery. 4-week elective periods. Alexandria Hosp.

381 **Perinatal Medicine** (5) Weingold, Fabro
Participation in high-risk obstetrics clinics and antepartum and intrapartum management of high-risk and normal obstetrical patients. Participation with the Fellow in maternal-fetal medicine at the University Hospital and outlying hospitals. 4-week elective periods.

383 **Clinical Gynecology** (5) Footer, Friedman
Participation in office practice of obstetrics and gynecology. 4-week elective periods.

386 **Clinical Obstetrics and Gynecology** (5) Cooper, Perkins
Participation in office practice of obstetrics and in gynecological surgery and delivery. 4-week elective periods.

387 **In-Patient Obstetrics and Gynecology** (5) Park
Supervise obstetrics and gynecology in a large military hospital; rounds and conferences. 4-week elective periods. Walter Reed Hosp.

390 **Extramural Obstetrics and Gynecology Elective** (arr.)
The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

Ophthalmology

Chairman: M.F. Armaly

Professors M.F. Armaly, D.E. Krueger *(Research)*
Clinical Professors M.G. Alper, M.M. Parks, L.E. Zimmerman
Associate Professors B.S. Fine *(Research)*, D.S. Friendly, J.S. Zacharia
Associate Clinical Professors W.S. Gilbert, L.M. King, Jr., F.G. La Piana
Assistant Professors Y. Jung *(Research)*, P.J. Riddle
Adjunct Assistant Professors R.M. Chavis, D.F. Greer
Assistant Clinical Professors D.G. Albert, D.K. Berler, H.N. Bernstein, D.T. Casey, W.P. Chalfant, Jr., R. Day, A.L. Fjordbotten, T. Frey, P.T. Gavaris, W.B. Glew, H.B. Gould, T.P. Keenan, M.D. Krinn, M.E. Lederman, J.H. Lodge, J.F. O'Neill, S.S. Pappas, D.E. Schwartz, K.A. Simon, J. Snyder, S. Stoleru, R.N. Sunga, D.M. Wanicur, P.V. Whitmore, H.S. Wicker, B.H. Zeavin, E.M. Zimmerman, M.H. Zimmerman
Clinical Instructors B.S. Bruner, R.S. Deitch, P.A. Dorn, Jr., A.E. Eager, C. Edmonds, B. Ehrlich, L.M. Friedman, W.H. Hall, R. Huberman, W.S.N. Ibrahim, L.L. Kogan, D.L. Lanter, G. Liss, J.F. Nowell, L.E. Perraut, H.I. Rodman, N.J. Ronsheim, H.J. Starr, E.M. Titer

281 **Ophthalmic Pathology I** (1) L. Zimmerman
Basic science aspects of diseases of the eye. (Spring)

282 **Ophthalmic Pathology II** (3) L. Zimmerm
Diseases of the eye as revealed by gross and microscopic examination. Op
to eight students. Armed Forces Inst. of Path. (Spring)

284 **Ophthalmic Pathology III** (5) L. Zimmerm
Daily participation in service limited to pathology of the eye and
adnexa. 4-week elective periods. Armed Forces Inst. of Path.

381 **Clinical Ophthalmology** (3 or 5) Armaly and S
Observation and participation in examination, diagnosis, and manageme
of wide variety of ocular conditions in ambulatory patients. Emphasis
conducting a general ophthalmic examination, recognition of abnormal fi
ings, and management of common ocular diseases. Lectures, rounds, a
seminars. 2- or 4-week elective periods. Burns Bldg.

382 **Clinical Ophthalmology** (3 or 5)
Observation and participation in examination, diagnosis, and manageme
of wide variety of ocular conditions. Emphasis on conducting a gene
ophthalmic examination, recognition of abnormal findings, and manag
ment of common ocular diseases. Lectures, rounds, and seminars. 2- or
week elective periods. Nat'l Naval Med. Center.

390 **Extramural Ophthalmology Elective** (arr.)
Special elective program arranged for selected students at other institution
Interested students should contact the chairman of the department.

Orthopaedic Surgery

Chairman: J.P. Adams

Professors J.P. Adams, H.L. Feffer, W.P. Fortune, P.I. Kenmore, F. Leonard *(Research)*, D.W. McKay, R.J. Neviaser, R.S. Snell

Adjunct Professor V.L. Nickel

Associate Professors S.F. Gunther, R.J. Lewis, S.S. Nason, D.B. Parsons *(Research)*, B.K. Slemmons

Adjunct Associate Professor G.P. Bogumill

Associate Clinical Professors D.M. Brody, R.L. Dow, U.M. Fortune, S.S. Hass, T.J. Radley, B.P. Vitek

Assistant Professors H.O. Goller *(Research)*, M.M. Malawer, R.B. Reff, S.W. Wiesel

Adjunct Assistant Professor H.S. Cattell

Assistant Clinical Professors A.I. Dobranski, S.H. Eisenberg, S.A. Lavine, C.W. McCutchen, P.A. Moskovitz, K.A. Peterson, S.R. Rothschild, G.J. Schoenholtz, M.A. Schultz

Adjunct Instructor W.J. Sadlack

Clinical Instructors B.R. Ain, R.L. Gaertner, J.H. Graeter, J.W. Harvey, D.C. Johnson, R.G. Loeffler, C.C. MacCartee, Jr., H.N. Mininberg, F.R.T. Nelson, T.J. Neviaser, R. Ottenberg, J.F. Witte

*302 **Clinical Clerkship in Orthopaedic Surgery** (3) Lewis and Staff

Basic clinical rotation in orthopaedics for second- and third-year students and fourth-year students who have not had previous orthopaedic rotations. Inpatient, outpatient, and emergency clinical care, with ward and night call responsibilities. Physical diagnosis, x-ray interpretation, trauma, and reconstructive surgery. 2-week elective periods. Univ., Children's, or V.A. Hosp., or Wash. Hosp. Center.

351 **Trauma** (1) Adams, Haas, Snell, Keimowitz

Relation of trauma to other disease entities and understanding of its effects on the musculo-skeletal system. Description of pathophysiological changes on tissues locally and systemically and of psychological reactions that may accompany such changes. (Spring)

380 **Orthopaedic Surgery** (5) Lewis

Students participate in care of orthopaedic inpatients and outpatients, daily rounds, and conferences under the direction of a faculty member at the University Hospital or one of the affiliated hospitals. Prerequisite: Orth 302. 4-week elective periods.

382 **Research in Orthopaedic Surgery** (arr.)

Participation in orthopaedic research to be arranged with various faculty members. Prerequisite: Orth 302.

383 **Sports Medicine** (3 or 5) Haas

Introduction to athletic injuries, including prevention and management. Prerequisite: Orth 302. Interested students should contact Dr. Haas. 2- or 4-week elective periods.

390 **Extramural Orthopaedic Surgery** (arr.)

The department arranges for students to spend elective periods in other institutions. Prerequisite: Orth 302. Interested students should contact the chairman of the department.

395 **Research in Orthopaedic Surgery** (arr.) Leonard

4-, 8-, 12-, or 16-week elective periods. Univ. Hosp.

Otolaryngology

Chairman: J.J. McFarland, Jr.

Clinical Professors D.N.F. Fairbanks, J.J. McFarland, R.E. Pumphrey, Jr., W.M. Trible, B.M. Webb

Associate Clinical Professors N.L. Barr, Jr., S. Epstein, B.A. Feldman, M.J. Fischer, I.S. Jaffee, M.E. Krucoff, J.L. Levine, R.S. Page, Jr., J.A. Sabri

Assistant Clinical Professors R.J. Bobys, S.B. Schreiber, A. Small

Clinical Instructors B.D. Burtoff, P.A. Coyne, D.E. Feldman, D. Isaacson, G.F. Miller, Jr., B. Modlin, H.H.E. Scheidemandel, H.C. Stein

* Required for medical students.

380 **Otolaryngology** (3 or 5)

Care of inpatients and outpatients. Diagnosis, therapy, rounds, and conferences. 2- or 4-week elective periods. Wash. Hosp. Center.

381 **Otolaryngology** (3 or 5)

Participation in care of outpatients, diagnosis, and therapy; rounds and conferences. 2- or 4-week elective periods. Private office practice.

390 **Extramural Otolaryngology Elective** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

395 **Clinical Clerkship** (3 or 5)

Inpatient and outpatient rotations; operating room experience. 2- or 4-week elective periods. Nat'l Naval Med. Center.

Pathology

Chairman: H. Sidransky

Professors S. Bloom, W.L. Marsh, M.J. Matthews, F.N. Miller, Jr., D.S. O'Leary *(Laboratory Medicine)*, H. Sidransky, B.H. Smith, M.J. Valaske, M. Werner *(Laboratory Medicine)*

Clinical Professors C.F. Bishop *(Radiation Therapy)*, H.W. Casey *(Comparative Pathology)*, C.B. Cook, G.H. Guin, E.B. Helwig *(Dermatologic Pathology)*, N.S. Irey, J.L. Luke *(Forensic Pathology)*, R.S. Melville *(Laboratory Medicine)*, R.E. Palmer, D.L. Weiss, M.J. Williams, L.E. Zimmerman *(Ophthalmic Pathology)*

Professorial Lecturers T.T. Antonovych, P.D. Olch *(History of Medicine)*, A.S. Rabson, W.C. Roberts *(Cardiology)*

Associate Professors A.A. Abraham, Y. Al-Doory *(Laboratory Medicine)*, R.S. Chandra, C.T. Garrett, J.G. Guccion, J.M.B. Hicks, F.S. Jannotta, S.G. Kant, R.B. Lingeman, Y.C. Oertel, L.G. Ortega, N.K. Saini, B.C. Zook *(Comparative Pathology)*

Adjunct Associate Professors A.F. Gazdar, W.P. Mulloy

Associate Clinical Professors B.D. Blackbourne *(Forensic Pathology)*, G.G. Brennan, W.F. Enos, I.D. Godwin, J.W. Howell *(Clinical Chemistry)*, F.B. Johnson, A.S. Lineberger, D.R. Parkinson

Associate Professorial Lecturer H.R. Schumacher

Assistant Professors K.H. Fischer *(Allied Health Sciences)*, H.P. Hawley, Jr., S.P. Kapur, C.N. Murty *(Research)*, J.M. Orenstein, R.H. Patterson, S. Silver, C.J. Zaloudek, J.A. Zeller *(Laboratory Medicine)*

Assistant Clinical Professors G. Controni, J.L. Hall, L.G. Hefter, P. Lupovich, G.M. McCullars, R.J. Montali *(Comparative Pathology)*, M.S. Nandedkar, M.K. Rifaat

Assistant Professorial Lecturers C.L. Czerwinski *(Laboratory Medicine)*, M.T. Jessee, C.W. Locke, Jr., W.P. Monaghan, C.M. Myers, D.E. Uddin

Instructor R.E. Dayhoff *(Research)*

Lecturers E.K.K. Andrus, M.J. Diaz, H.I.O. Doerr *(Laboratory Medicine)*, D.D. Erickson, J.E. Forey, R.S. Horkman, J.W. Jones, S.V. Meade, E.A. Michielli, W.A. Rey, L.D. Saxton, D.E. Schubert

Special Lecturers A.A. Cooper, C.E. Daniels, W.C. Fox, S.G. Gerding, J.T. Johnson III, G.A. Lehmer, J.E. Montgomery, L.W. Ouderkirk, R.L. Peckham, J.F. Schaumleffel, V.E. Shipilov

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Courses numbered 13 through 20 are limited to military personnel in the Medical Laboratory Technique Program.

13 **Hematology** (6) Staff

Basic hematologic procedures, diagnosis of abnormalities of cellular elements of blood and bone marrow, studies in blood coagulation, quality control in clinical hematology.

14 **Blood Banking** (6) Staff

Principles of immunohematology, blood donor center techniques, blood processing techniques, quality control in blood banking.

15 **Clinical Laboratory Rotation** (14) Staff

Instructions in laboratory technique, stressing the application of theories and principles of clinical chemistry, clinical microbiology, hematology, and blood banking in the day-to-day operations of the modern clinical laboratory.

16 **Clinical Chemistry** (5) Staff

Principles and techniques of blood chemistry analyses, including toxicological analyses for drugs of abuse and environmental poisons.

17 **Urinalysis** (2) Staff

Principles and techniques of urine chemistry and microscopic analysis.

18 **Bacteriology** (6) Staff

Identification of pathogenic micro-organisms by morphologic and cultural techniques.

19 **Parasitology** (4) Staff

Identification of human parasites and their life cycles; concentration methods, staining techniques and media for culture.

20 **Serology** (2) Staff

Principles and techniques of antigen-antibody reaction and immunological responses.

Courses numbered 121 through 128 are open only to students enrolled in the Bachelor of Science degree program with a major in medical technology.

121 **Introduction to Medical Technology** (4) Silver

Six-week orientation in laboratory medicine. (Fall)

122 **Clinical Chemistry Lecture** (3) Staff
Lecture series on routine and special clinical chemistry techniques. (Spring)

123 **Clinical Microbiology Lecture** (2) Silver
Lecture series on bacteriology, mycology, and virology. (Fall)

124 **Blood Bank Lecture** (1) Marsh and Staff
Lecture series on immunohematology and transfusion service. (Spring)

125 **Clinical Hematology Lecture** (2) Fischer
Lecture series on routine and special hematology and coagulation. (Fall)

126 **Selected Topics in Laboratory Medicine** (2) Fischer, Silver
Lecture and laboratory series on clinical parasitology. Miscellaneous topics in fluid analysis. (Spring)

129 **Pathology for New Health Practitioners** (3) Staff
Lecture course with optional laboratory. Basic pathologic concepts and infectious diseases; language of pathology; fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathologic changes in the principal diseases of each organ system presented in coordination with clinical lectures in Idis 301. (Fall and spring)

130 **Clinical Chemistry** (4) Silver
Rotation through the University hospital clinical chemistry laboratory. (Fall and spring)

131 **Clinical Microbiology** (4) Silver
Rotation through the University hospital clinical microbiology, mycology, and parasitology laboratories. (Fall and spring)

132 **Hematology/Coagulation** (4) Silver
Rotation through the University hospital clinical hematology and coagulation laboratories. (Fall and spring)

133 **Blood Bank/Serology/Urinalysis** (4) Silver
Rotation through the University hospital blood bank, serology, and urinalysis laboratories. (Fall and spring)

152 **Introduction to Basic Laboratory Medicine** (2) Fischer
Theory, performance, and interpretation of some important routine clinical laboratory tests performed in a physician's office, such as complete blood counts with differentials, staining and reading smears, urinalysis and microbiological culture and staining techniques, and organism identification. Lectures, demonstrations, audiovisuals, and laboratory. Prerequisite: Path 129. (Summer)

*201 **Pathology** (8) Staff
A year course; required for second-year medical students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Staff

203–4 **Pathology** (4–4)
For graduate students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross

*Required course for medical students.

and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 204: Path 203. (Academic year)

*205 **Comparative Pathology I** (3) Zook

Study of disease in vertebrates, comparison with disease in humans. Mechanisms by which various agents provoke illness; body defensive reactions. Illustration of common diseases of various species, including material from captive wild animals. Recommended prerequisite: courses in anatomy, histology, and physiology. (Fall)

*210 **Comparative Pathology Laboratory** (2) Zook

Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to four students. Path. Lab., Nat'l Zoological Park. (Fall)

*215 **Perinatal Pathology Laboratory** (2) Kent

Special assignments for dissection and study. Univ. Hosp. (Fall—6 hours per week)

217 **Gross Autopsy Pathology** (1) Blackbourne, Miller

Review of current necropsy cases. Interpretation of clinical symptoms and signs and radiographs on the basis of gross changes in organs. Univ. Hosp. (Spring)

220 **Medical Mycology** (2) Al-Doory

Study of pathogenic fungi, mycotic diseases, and their clinical aspects. Emphasis on handling specimens, diagnosis, and identification of etiologic agents. (Fall)

221 **Medical Mycology Laboratory** (1) Al-Doory

Laboratory complement to Path 220. Prerequisite or concurrent registration: Path 220. Laboratory fee, $20. (Fall)

222 **Opportunistic Mycoses** (2) Al-Doory

Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

252 **Forensic Pathology and Medical Jurisprudence** (1) Blackbourne, Riddick

Somatic death, coroner and medical examiner systems, pathology of physical and chemical injuries, medical licensure; the physician-patient relationship and professional liability are discussed. (Spring)

253 **Medicine in Shakespeare** (1) Miller

Seminars with student and staff presentations covering the medically significant plays of William Shakespeare. (Spring)

254 **Medicine in Literature** (1) Miller

Series of discussions with student and staff presentations covering novels, drama, nonfiction, and poetry of medical significance. (Fall)

261 **Seminar in Experimental Pathology** (1) Sidransky

Current topics in research in experimental pathology. (Spring)

* Open to limited number of graduate students, with permission.

266 **Comparative Pathology Elective** (1) Zook

Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to four students. Path. Lab., Nat'l Zoological Park. (Spring)

272–73 **Seminars in Mycology** (1–1) Al-Doory

Conferences and discussions on current topics and latest developments in medical mycology. Open to graduate students and residents. May be repeated for credit. (Fall and spring)

275 **Research in Mycology** (2) Al-Doory

Participation in experimental studies in mycotic diseases. Research in laboratory or community medicine related to mycology. May be repeated for credit. (Fall and spring)

280 **Surgical Pathology I** (2) Staff

Surgical pathology service at participating hospitals. Examining specimens from current surgical cases, correlating with clinical manifestations. Univ. Hosp. (Spring—3 hours per week)

284 **Ophthalmic Pathology** (5) Zimmerman

Daily participation in an active service limited to pathology of the eye and its adnexa. Inflammatory, degenerative, and neoplastic diseases comprise the major categories. 4-week elective periods. Armed Forces Inst. of Path.

286 **Perinatal Pathology** (5) Kent

Participation in perinatal (fetal and newborn) necropsies. Study of selected teaching cases. Examination of selected placentas for disease. 4-week elective periods. Univ. Hosp.

287 **Immunohematology and Blood Banking** (5) Marsh

Preparation and use of blood and blood products in surgery and in blood diseases studied from laboratory and clinical viewpoints. Emphasis on management of acute clinical situations. 4-week elective periods. Univ. Hosp.

289 **Clinical and Anatomical Pathology** (5) Cook

Participation in daily studies of surgical and necropsy pathology, including forensic pathology; clinical pathology projects including hematology, isotopology, bacteriology, or any single area in which the student has a particular interest. 4-week elective periods. Fairfax Hosp.

290 **Extramural Pathology Elective** (arr.) Sidransky

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

291 **Clinical and Anatomical Pathology** (5) B. Smith

Opportunity to explore in depth a topic selected from the field of pathology, library study. 4-week elective periods. V.A. Hosp.

294 **Forensic Pathology** (5) Luke, Blackbourne

Participation in the activities of the office of the Chief Medical Examiner of the District of Columbia. Observation of death scene investigation techniques, medical-legal autopsies, and related toxicological laboratory analyses, attendance at court trials, and participation in the various scheduled conference activities of the agency. 4-week elective periods.

*295 **Comparative Pathology II** (arr.) Zook, Montali

Participation in veterinary pathology service, including wild and domestic animals. Graduate students receive five semester hours of credit for each four-week period and may receive up to 30 semester hours of credit for six months full time. Medical students receive five semester hours of credit for each four-week elective period. Prerequisite: Path 201 or 203–4, and 283. (Medical students: 4-week elective periods. Path. Lab., Nat'l Zoological Park, and Armed Forces Inst. of Path. Graduate students: fall or spring)

296 **Surgical Pathology II** (5) Staff

Evaluation of surgical specimens and correlation with clinical status of patient; description of gross and microscopic findings on assigned cases. 4-week elective periods. Univ. Hosp.

297 **Dermal Pathology** (5) Hannagan

Microscopic conferences, review of current material and study sets. 4-week elective periods. Prerequisite: prior arrangement with instructor. Armed Forces Inst. of Path.

298 **Necropsy Pathology** (5) Orenstein

Organ changes in disease, gross and microscopic examinations, preparation of protocols. 4-week elective periods. Univ. Hosp.

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Pharmacology

Chairman: H.G. Mandel

Professors V.H. Cohn, Jr., S.E. Fabro, P. Klubes, H.G. Mandel, P. Mazel, J.A. Straw, J.R. Williams *(Research)*

Professorial Lecturers J. Axelrod, E. Costa, N.H. Neff

Associate Professors F.P. Abramson, R.J. Anderson, A.M. Suria, P.F. Teychenne

Assistant Professors B.L. Bean, N.A. Brown

21–22 **Chemistry and Physics of Anesthesia** (3–3) Mazel and Staff

For students in nursing anesthesia. Fundamental concepts of physics; general chemistry, organic chemistry, biochemistry, and their application to

* Open to limited number of graduate students, with permission.

medicine and anesthesiology, including chemistry of respiration, acid-ba
balance, clinical biochemistry and enzymology, hormones, radioisotope
electronics, physiochemical properties of anesthetic agents, and other r
lated topics. (Academic year)

110–11 **Pharmacological Basis of Anesthesia** (4–4) Mazel and Staf

For students in nursing anesthesia. Fundamental principles of pharmacol
gy; drugs affecting the autonomic nervous system, central nervous syste
and cardiovascular system; fundamentals of inhalation anesthesia; auxiliar
drugs used in anesthesiology; endocrines, cancer chemotherapy; other
topics. (Academic year)

114 **Drugs and the Consumer** (3) Cohn and Staf

General concepts concerning drug action in the body. Mechanism of actio
of some specific prescription and nonprescription drugs, including contra
ceptives; tranquilizers and sleep-inducing drugs; hayfever, headache and
cold remedies; analgesics; antibiotics; vitamins. Issues related to develop
ment and marketing of drugs, drug safety, drug advertising, generic versus
trade-name drugs, drug use in sports, drug use during pregnancy, smoking
and health. No science prerequisite required. Limited enrollment.
(Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn and Staf

Psychological and sociological bases of recreational and other nonmedica
use of drugs, pharmacological and toxicological aspects of drug action on
both the brain and peripheral organ systems, legal and societal implica
tions of and reactions to the nonmedical use of drugs, prevention and
treatment of drug dependence. Lectures and discussions on alcohol, nar
cotics, central nervous system stimulants and depressants, marijuana, hal
lucinogenic and psychedelic drugs. (Spring)

120 **Readings in Pharmacology for Anesthesia** (arr.) Mazel and Staf

For students in nursing anesthesia. Assigned reading in anesthesia and re
lated areas; preparation of reports.

130 **Seminar: Accessory Drugs in Anesthesia** (2) Mazel and Staf

For students in nursing anesthesia. Presentation of the pharmacology and
pharmacodynamics of accessory anesthetic drugs; emphasis on those areas
not covered in Phar 110–11.

158 **Pharmacology for New Health Practitioners** (2) Klubes and Staf

For students in allied health programs. Basic pharmacology course. Drug
preparations, the basis of their therapeutic and toxic actions and their fate
in the body. Prerequisite: HCS 110, 112, Phyl 111.

191 **Respiratory Care** (3) Mazel and Staf

Same as Anes 191. For students in nursing anesthesia. Advanced techn
niques for care of patients requiring total respiratory support.

195 **Electronics for Medical Personnel** (2) Mazel and Staf

Same as Anes 195. For students in nursing anesthesia. Introduction to fun
damental principles used in electronic instrumentation for monitoring pa
tient status in operating room and intensive care unit. Signal conditioning,
processing and display techniques, special purpose instruments, safety haz
ards.

201–2 **Pharmacology** (6–2) Straw and Staf

Required for second-year medical students. Lectures, laboratory, confer

ences on interaction of drugs and biological systems as a basis for rational therapy of disease. Prerequisite: Bioc 201, Phyl 201, 212.

203 **Fundamental Principles of Pharmacology** (3) Cohn and Staff

Basic principles of pharmacology, including drug-receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, drug toxicity. Admission by permission of instructor. (Fall)

205–6 **Pharmacology** (6–2) Cohn and Staff

For graduate students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Pharmacodynamics, mechanisms of action, physiological disposition, toxicity, and relative evaluation of drugs. Prerequisite to Phar 205: Bioc 221–22, Phar 203, Phyl 201, 212, or approval of department. Prerequisite to Phar 206: Phar 205. (Fall)

207 **Cardiovascular Pharmacology** (2) Bean

Physiology and pharmacology of cardiovascular diseases, hypertension, heart failure, coronary artery disease, arrhythmia. Mechanism of action of drugs used in the treatment of cardiovascular diseases. Prerequisites: Phys 201 and Phar 201, 203, or 205. (Spring)

215 **Adolescent Drug Abuse** (3) Cohn and Staff

Not open to medical students. Offered off campus through the College of General Studies. Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, marijuana, hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Mazel and Staff

For medical and graduate students. Recent advances and fields of research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

256 **Molecular Pharmacology** (2) Hahn

For medical and graduate students. Current theory on action of drugs, especially chemotherapeutic agents, at molecular level. Effect of drugs on biosynthetic processes of the cell with respect to DNA, messenger RNA, transfer RNA, ribosomes, protein, cell wall, and intermediary metabolites. Factors which alter action of drugs, such as drug interactions and resistance. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff

For medical and graduate students. Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

260 **Endocrine Pharmacology** (1) Hertz and Staff

For medical and graduate students. Lectures and seminars on recent advances in the pharmacology and mechanism of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (3) Staff

For graduate students. Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff
For graduate students. Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn
For graduate students. Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, excretion of drugs; physical, chemical, and biological factors affecting these processes. Prerequisite: Phar 201 or 205–6 or permission of instructor. (Spring, even years)

273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff
Compartmental and physiological models of drug disposition. Problem-solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology I–II** (1–1) Anderson and Staff
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology III–IV** (1–1) Anderson and Staff
Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) Staff
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Suria and Staff
Fundamental principles of neuropharmacology. Electrophysiological and biochemical techniques in studying neuropharmacology. Neurotransmitters and their pathways in central nervous system. Drug effects on various neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Pharm 205–6 or equivalent. (Spring, odd years)

285 **Readings in Pharmacology** (arr.) Mazel
For medical students. Assigned reading and preparation of reports. (Fall and spring)

286 **Research in Pharmacology** (arr.) Staff
For medical students. Participation in experimental studies in pharmacology, particularly endocrinology, cancer chemotherapy, or drug metabolism. (Fall and spring)

287 **Readings in Drug Abuse Literature** (arr.) Cohn, Klubes
Both professional and nonprofessional literature in the general area of drug dependence. Informal monthly luncheon discussions. (Spring)

295 **Reading and Research** (arr.) Staff
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

390 **Extramural Clinical Pharmacology** (arr.)
The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general exami- May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. **(Fall and spring)**

Physiology

Chairman: R.A. Kenney

Professors J.J. Bernstein *(Research)*, M.M. Cassidy, M.J. Jackson, R.A. Kenney, C.S. Tidball, M.E. Tidball
Professorial Lecturers D.O. Carpenter, J.C. Gillin
Associate Professors R.A. Lavine, J.R. Trubatch *(Research)*, D.W. Watkins
Associate Professorial Lecturers M. Frank, M. Katzper, K.R. Spring
Assistant Professor J.K. Kelleher
Assistant Professorial Lecturer D.S. Forman
Special Lecturer C.O. Abernathy

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201.

111 **Physiology for New Health Practitioners** (3) M.E. Tidball
For students in physician's assistant, nurse practitioner, and nursing anesthesia programs. Lecture, film, and demonstration. Function and process of the human body covering the major organ systems.

191 **Selected Topics in Human Structure and Function** (3) Kenney
Lecture (2 hours), laboratory (1 hour). Structural and functional basis of physiology. Undergraduate course, required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with approval of advisor. (Fall)

*201 **Physiology** (8) Staff
Lecture (8 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied human physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 201 or 221–22 (Bioc 222 may be taken concurrently); or consent of chairman of department. Open

* Required for medical students, open to graduate students.

to consortium students only with permission of department chairman. (Spring)

205 **Cell Biophysics** (2) Jackson

Introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. Required for graduate students intending to take Phyl 201. Students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in Columbia College with approval of advisor. (Fall)

212 **Neurobiology** (3) Staff

Same as Anat 212 and Idis 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221 **Seminar** (1) Cassidy

Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

223–24 **Biomedical Instrumentation** (4–4) Staff

Same as Bioc 225–26 and Micr 240–41. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical and forensic scientists. Labratory fee, $50. (Academic year)

251 **History of Medicine** (1) M.E. Tidball

Survey of the great contributors to physiology and medicine in the context of the times in which they lived and worked. (Fall)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy

Discussion of principles of fluid and acid-base balance and the application of these principles to specific situations. (Fall)

254 **Overview of Medical Computing** (2) C. Tidball

Medical applications of computers. Practical experience at a minicomputer console to demonstrate computer principles.

261 **Gastrointestinal Physiology** (1) Jackson, Dobbins

Weekly seminar; role of basic sciences in gastroenterology; intra- and extra-mural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey, at an advanced level, of aspects of cardiovascular physiology especially as interrelated with the respiratory and renal systems. (Fall)

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Admission by permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball

Lecture one hour per week, practical experience at student's convenience. Orientation to digital and analog mini-computers. Programming in several

languages. Experience with one or more computers. No previous computer experience necessary. (Fall)

271 **Computer Simulation of Physiological Processes** (3) C. Tidball

Programming of physiological simulation will be learned by writing a series of simulations of increasing complexity. Prerequisite: Phyl 270 or equivalent, or permission of instructor.

272 **Reading and Research in Simulation of Physiological Processes** (3) C. Tidball

Readings and discussion on physiological simulations and their evaluation. Prerequisite: Phyl 271 or equivalent, or permission of instructor. May be repeated once for credit.

282 **Experimental Physiology** (3 or 5) Staff

Participation in an ongoing research program in the department. Programs are currently available in the areas of membrane physiology, intestinal transport, neurophysiology, and cardiovascular physiology. 2- or 4-week elective periods.

284 **Advanced Physiology** (3 or 5) Staff

Guided study or laboratory experience at an advanced level in a subfield of physiology. Prior arrangements should be made with the individual faculty member. 2- or 4-week elective periods.

290 **Extramural Physiology Elective** (arr.)

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

295 **Research** (arr.) Staff

By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of credit. (Fall and spring)

298 **Comprehensive Physiology** (arr.) Staff

Guided review of selected areas of physiology appropriate to the student's graduate program. This course satisfies the requirements for the Master's Comprehensive Examination, the Field Examination for doctoral students minoring in physiology, and Part I of the Cumulative General Examination. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

396 **Advanced Reading and Research** (2) Staff

Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff

Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problem. This course satisfies the requirement for Part III of the Cumulative General Examination in physiology. (Fall and spring)

399 Dissertation Research (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for cred
(Fall and spring)

Psychiatry and Behavioral Sciences

Chairman: J. Wiener

Professors C.K. Conners, R.B. Kurz, J.D. Noshpitz, S. Perlin, J.E. Rankin, D. Reiss, T.G. Webster, J.M. Wiener, L. Yochelson

Adjunct Professor R.E. Strange

Clinical Professors S. Berman, C.T. Bever, B.S. Brown, R.N. Butler, P. Cho doff, R.M. Coleman, L. Cytryn, C.J. Frederick, K.R. Gaarder, R.D. Gil man, G. Gordon, W.L. Granatir, J.S. Kafka, M.M. Katz, M. Kleinerman, E.I. Kushner, H.P. Laughlin, B.W. MacLennan, H.A. Meyersburg, T.D. Noble, B. Olshaker, R. Peele, J.L. Rapoport, H.L.P. Resnik, R.E. Rieger, L.D. Robinson, J.G. Rubin, P. Rubovits-Seitz, M.D. Ruffin, R.L. Shapiro, M.F. Shore, J. Spurlock, W. Stark, W.J. Stockton, G.R. Ticho, H. Weiner *(Experimental Psychology)*, H.M. Work

Associate Professors J.K. Barber, D.C.T. Choate *(Social Work)*, J.H. Egan, C.B. Feinstein, B.L. Frankel, M. Hertzman, J.J. McMillan *(Psychology)*, J. Ravenscroft, Jr., L.I. Sank, W.H. Scott, P.J. Steinglass, J.H. Wise

Adjunct Associate Professors A.T. Billett, F.K. Millican

Associate Clinical Professors M.T. Advanti, L.W. Allen, E. Black, B.L. Burris, J.A.F. Chused, R.M. Costell, A. D'Agostino, D.I. Davis, B.B. Doyle, J.B. Erdmann, J.N. Follansbee, J.A.H. Forgotson, J.J. Francis, M.S. Glatt, C. Goldberg *(Psychology)*, S.L. Goodman, S. Gordon, Jr., R.M. Greenberg, S.I. Greenspan, R.L. Gross, M.R. Haas, J.H. Herzberg, F.G. Hilkert, H.A. Hoffman, J.A. Huntzinger, W.C. Johnson, I.H. Kaiser, K.L. Kaplan, J.J. Katzow, H.B. Lehrman, E.J. Leiberman, S.H. Lipsius, T.M. Mackenzie, J.R.S. Malkin, A.E. Marans, I.H. Marill, J.E. Meeks, J.H. Menetrez, I.D. Milowe, D.Y. Patterson, J.M. Post, J.T. Quattlebaum, R.A. Ratner, C.B. Robinowitz, M.E. Robinson, R.A. Rogers, S. Rosenblum, G. Scarcella, J.L. Sheridan, M.R. Skolnick, J.H. Smith, M.J. Stern, B.C. Straight, D.L. Tip pett, G.A. Tripp, H.J. Wain, A.F. Ward, Jr. *(Sociology)*, P.S. Weisberg, R.E. Wittenberg, S.J. Wolin, I.M. Zimmerman, J. Zinner

Associate Professorial Lecturer M. Engel

Assistant Professors L.A.M. Bennett *(Research)*, M.A. Borengasser, B.A. Cope land, I. Dosovitz, J.L. Gaiter, R.A. King, A.B. Livingood, M.E.P. Oliver *(Research—Psychology)*, E.M. Plionis *(Research)*, C.S. Shaffer, J.R. Shapiro, S.M. Sotsky, L.A. Vitulano, K.C. Wells

Adjunct Assistant Professors L.H. Haller, J.A. Jay, R.S. Richmond *(Social Work)*

Assistant Clinical Professors S.L. Aledort, R.G. Ammerman, B.S. Arons, W.E. Barquist, E.C. Bergman, S.L. Billet, J.H. Bouma, M. Boverman, C.V.A. Cabrera, M.J. Chalick, P.E. Chanel, D.L. Charney, C.T. Chastek, J.C. Chatel, I.M. Chatoor-Koch, M.M. Clancy, W.F. Conger, L.R. Conte, E.W. Cotlove, L.A. Cove, G.P. Davis, C.T. Dunn, R.C. Eisner, J.L. Evans, D.H. Fram, C.H. Frank, J.A. Frank, Jr., R.A. Frank, S.L. Friedman, G.P. Gabe, D.J. Gardner, M.L. Garrett, R.J. Garson, R.B. Gerber, M. Giller, D.R. Glass, Jr., M.R. Goldberger, K.P. Gorelick, B.C. Gorman, R.A. Greenberg, S.A. Hassan, N.B. Heller, M.H. Herbert, P.B. Holly, K. Huang, B.P. Jones, D.I. Joseph, R. Kayton, R.W. Keisling, K.A. Kessler, G.F. Kolodner, B.L. Kraff, L.E. Kreuz, B.J. Landau, P.A. Lange, D.A. Lanham, B.E.S. Lawrence, P.D. Leber, G.D. Legler, L.D. Levi, R.T. Lewit, D.G. Lipman, T.J. Lustberg, J.R. Maloney, C.I. Margolis, B.P. McKaig, D.H. McKnew, Jr., H.M. Meagher, E.S. Meid, W.B. Mendelson, G.H. Miller, B.R. Milowe, A.B. Molchon, D.T. Mosher, P.F. Namrow, R.A. Nover, A. Olaciregui, R.R. Palmer, S.R. Pieczenik, H.A. Pincus, V.E. Powell, J.W. R-Love, J.L. Read, H.W. Rice, K.C. Rickler, R. Rubovits-Seitz, A.R. Sager, A.J. Salerian, A.H. Sandler, P.J. Santora, S.A. Savitz, G. Schaeffer, D.E. Scharff, J.A. Schoettler, G.W. Schwarcz, N.A. Schweig, J.R. Sealy, B.M. Smoller, E. Sorel, E.A. Sorrentino, G.J. Soverow, A.H. Stein, H. Steinberg, P.J. Steinberg, F. Strassburger, E.S. Taylor, R.S. Teitel, W.F. Thompson, C.C. Titus, L. Turner, M.L. Usher, R.W. Wadeson, Jr., J.P. Waletzky, D.R. Weinberger, S.M. Weissman, J.L. Wellhouse, N.L. Wilson, A.B. Zients

Assistant Professorial Lecturer A. Zappala

Instructor D.L. Loiselle *(Research)*

Adjunct Instructors N.B. Delston, P.D. Kramer, G.K. Palys, E.K. Wolf *(Social Work)*

Clinical Instructors J.M. Chertoff, M.W. Gross, M.M. Herenda, T.N. Jacob, J.A. Jurand, F.L. Kolodner, J.E. Lincoln, R.B. Lott, K.L. Owens *(Social Work)*, D. Pope, N. Sacirbey, M.M. Schwartz, C. Schwarzbeck, S.W. Skoler, T.A. Teplitz, X. Tonesk

Special Lecturers S.P. Levi, R.L. Siegel

All clinical courses are five credit hours per four-week period.

250 **Individual Student Preceptorship** (1) Wiener and Staff

First- and second-year medical students can arrange individual preceptorships other than departmental electives listed below with the permission of the chairman of the department.

*252 **Psychological and Social Factors of Medical Practice** (1) Reiss and Staff

Basic principles of the doctor-patient relationship. Analysis of psychological growth and development, family process, and the personality of the physician as they influence everyday medical practice.

*301 **Psychopathology and Conceptual Models** (3) Dunn and Staff

For second-year medical students. Mental mechanisms, psychopathology, introduction to psychiatric syndromes, clinical interviewing, behavioral sciences in clinical medicine. (Fall)

* Required for medical students.

*302 **Clinical Clerkship** (10) Webster, Gil
Hoffman, Ryder and St

Supervised examination, diagnosis, out-patient and in-patient treatment University, St. Elizabeths, Children's, and Washington V.A. Hospi and Psychiatric Institute. Case conferences, seminars on psychiatric re ral, "psychiatric" drugs, community resources. Psychiatry in general pr tice stressed. (Fall and spring)

353 **Basic Psychoanalytic Concepts; Clinical Illustrations** (1) St

Basic psychoanalytic concepts such as dreams, transference phenomena, a the various components of personality structure. Participation in discu sions focusing on psychoanalytic issues and the relevance of such concep to the practice of medicine in general. For first- or second-year medica students. Wash. Psychoanalytic Soc. Bldg. (Spring—eight two-ho sessions)

365–66 **Seminar: Advanced Family Diagnosis and Psychotherapy** (3–3) Steinglas

Combined didactic and clinical exercises designed to offer in-depth unde standing of family therapy theory and technique. Open to postgraduat physicians and advanced graduate students in the behavioral sciences.

381 **Clinical Psychiatry** (5) Hertzman, Sotsky, Frankel
Wiener, Perlin, Dosovit

Student performs as acting intern on one or more of the psychiatry ser ices of the Medical Center: inpatient and emergency (Hertzman), outpa tient (Sotsky), and consultation-liaison (Frankel). Assignments are base on student preference within limits of feasibility for the elective period involved. 4-week elective periods.

Frankel

383 **Psychological Aspects of Medical Illness and Care** (5)

Student participates in an individualized program on the consultation-lia son service, with emphasis on psychosocial factors affecting the onset manifestations, and treatment of medical illness. Involvement in consulta tion process, conferences, liaison meetings, individual supervision of clini cal work, and related readings. 4-week elective periods.

384 **Outpatient Psychiatry** (10) Sotsky, Steinglas

Student participates as acting intern in multidisciplinary outpatient clinic team. Diagnostic assessment, crisis intervention, pharmacotherapy; supervi sion of clinical work and readings in field; participation in clinical case conferences, assessment conferences, and relevant resident seminars. 4- week elective periods.

Stern

385 **Psychosocial Aspects of Heart Disease** (5)

Student participates under direct supervision of faculty in individual and group work with post-myocardial infarction patients and their families during hospitalization and the subsequent follow-up period. Study of psy chological, social, and physiological aspects of heart disease, including exercise and rehabilitation. Participation in related seminars, psychiatry- medicine liaison activities, and related readings and discussion. 4-week elective periods.

* Required for medical students.

386 **Substance Abuse** (5) Advani

Student participates in individualized program in alcohol and/or other drug abuse. Supervised clinical work with patients and families, research experience, and related readings. Participation in seminars and team activities. 4-week elective periods.

387 **Family Research** (10) Reiss and Staff

Student participates in family research and performs own project with individual supervision. Related readings. 8-week elective periods.

388 **Child and Adolescent Psychiatry** (5) Egan, Noshpitz, Wiener, Feinstein, Ravenscroft

Student performs as acting intern in child psychiatry. A specialized elective in consultation to pediatric wards, outpatient evaluation and treatment of selected child patients and their families, and/or inpatient child and adolescent services. Eight weeks required for specialized experience in all three areas. Individualized program by arrangement. Assignments based on student's preference and prior experience, within limits of feasibility for elective period involved. 4-week elective periods. Children's Hosp.

390 **Extramural Psychiatry Elective** (5)

The department may arrange for students to spend elective periods at other institutions. 4-week elective periods.

397 **Schizophrenic and Borderline Conditions** (5) Ehlers, Bullard*

Student participates in, observes, and studies the treatment and administrative management of patients. Participates in staff meetings. Individual supervision and selected readings. 4-week elective periods. Chestnut Lodge, Rockville, Md.

398 **Clinical Psychiatry** (5) Giller and Staff

Student participates in clinical care of patients in a public mental hospital and community mental health center. Opportunity for observation and participation in a variety of treatment modalities: supervised individual and group therapy, somatic therapies, psychodrama. Research opportunity available. 4-week elective periods. St. Elizabeths Hosp.

400 **Forensic Psychiatry** (5) Ward

Opportunity to study and work, under close supervision, with patient/defendants sent by the court for psychiatric evaluation and mentally disordered offenders sent to the hospital for treatment. Programs are individualized to meet student's interests. 4-week elective periods. St. Elizabeths Hosp.

404 **Clinical Research and Psychopharmacology** (5) Goodwin and Staff

Student participates in clinical research at the Clinical Psychobiology Branch, N.I.M.H., which conducts a research and treatment program on depression and manic-depressive disorders. Facilities include an inpatient ward, outpatient department, and biochemical laboratories. Student works on an individualized component of a major research project with direct supervision by a research psychiatrist. Participation in clinical conferences, didactic lecture series, research conferences, and planning meetings. 4-week elective periods.

406 **Psychiatric Education, Research, and Administration** (5) Robinowitz and Staff

Student preceptorship. Practicum experience, theoretical instruction, partic-

* Dr. Bullard is Senior Consultant at Chestnut Lodge.

ipation in research, and individual project. Close working contact
director and staff of education office of national specialty society. Op
tunity to observe operations and for contacts with leaders in field. Stu
gains knowledge and perspective of research and administration perta
to women in medicine, psychiatric education, manpower development
vant to health care delivery, continuing education, federal and legisla
affairs, health planning, and relation of medical education to practi
Prior personal interview required. 4-week elective periods. Americ
Psychiatric Ass'n.

Webs

409 **Independent Studies** (5)

Individualized studies, clinical training, or research experience. Selectio
on basis of student interest, personal interview, and available resource
Possible subjects may include death and dying, suicide, medical ethics,
other psychiatry and behavioral science interests of the student and av
able faculty. 4-week elective periods.

Weisb

411 **Group Therapy** (1)

Combined didactic and participatory course in group therapy. Studen
will function as observer-members of on-going group, and will participa
in lecture-supervision sessions.

Robins

412 **Mental Health Issues for Deaf People** (1)

Mental health and illness from the perspective of auditory deprivation
Lectures, discussion, films, and field trips to educational and mental heal
facilities for deaf people are combined with varying degrees of practica
and research involvement.

413 **Autobiographical and Fictional Accounts of Madness** (1) Gorelick

Reading of a variety of personal accounts—some fictional, others auto
biographical—of the inner experience of madness. Works include *Brea*
down by Robert Dahl and *50 Minute Hour* by Robert Lindner. St. Eliz
beths Hosp.

Gorelick

414 **History of Mental Illness and Therapeutics** (1)

Consideration of the historical periods of primitive healing, Greek medi
cine, Arabic medicine, Christian healing, witchcraft phenomena, and ke
developments of the last 200 years.

Robinowitz

415 **Identity and Role of the Physician** (1)

The role and identity of the physician, with special emphasis on women
physicians. Didactic material on the role and identity of the physician
combined with experiential models, including group dynamics. (Limited t
six students.)

Kaiser

416 **The Application of Psychoanalytic Principles to the Practice of Medicine** (1)

Offered by the Extension Division of the Washington, D.C., Psychoana
lytic Institute. (Limited to six students.)

Legid

417 **Geriatric Psychiatry** (1)

Students accompany preceptor who functions as geriatric consultant to
the National Capital Housing Authority.

Wolin and Staff

418 **Medical Aspects of Alcoholism** (3)

Seminar in alcohol abuse and alcoholism focusing on the natural course o
the illness, diagnosis, assessment, and evaluation of the alcoholic individua
and family. Prerequisite: permission of instructor. (Fall)

419 **Seminar: Special Topics and Techniques in Family Psychotherapy (3)** Steinglass, Usher

An advanced seminar for family therapists. The concept of the family life cycle will be used as a framework for identifying specific developmental phases in family life. Marital therapy, family therapy with young children, sexual dysfunction, divorce, occupational crises, retirement. Phase-specific problems and specialized intervention techniques. Participants must be currently seeing families in therapy. Permission of the instructor(s) required.

420 **Research Methods for the Direct Study of the Family** (3) Reiss

Basic concepts in the design of quantitative studies of the development and function of the family. Topics to be covered include the use of theory, grounded observations, and personal experience in the design of research; analyses of verbal interaction; social systems analyses; a comparative analysis of interview methods, laboratory procedures, and naturalistic observations. Prerequisite: permission of instructor. (Fall)

421 **Supervision of Marital and Family Therapy** (3) Usher

Issues in the supervision of students of marital and family therapy. Various techniques of supervision (written report, audiotape and videotape, and one-way mirror) will be explored. Issues related to teaching and learning objectives, student and supervisor relationships, accountability, and confidentiality will be examined. Participants will be required to have a student whom they are currently supervising. Videotapes of the participants' supervisory sessions will be examined in class. Prerequisite: permission of instructor.

422 **Introduction to Family Theory and Therapy** (3) Davis

Readings in structural and problem-solving approaches to family therapy and live observation of families and couples with recent hospitalized acute psychiatric patients. Prerequisite: permission of instructor.

Radiology*

Chairman: D.O. Davis

Directors of Divisions: A.C. Wyman *(Diagnostic Radiology)*, R.C. Reba *(Nuclear Medicine)*, D.J. Goodenough *(Radiation Physics)*, C.C. Rogers *(Radiation Oncology and Biophysics)*

Professors E.W. Bradley *(Research)*, D.O. Davis, W.C. Eckelman *(Nuclear Medicine)*, A.M. Lewicki, M. Majd, W.J. McSweeney, W.W. Olmsted, R.C. Reba *(Nuclear Medicine)*, S.D. Rockoff, C.C. Rogers *(Radiation Oncology)*, B.J.L. Sauerbrunn *(Nuclear Medicine)*, V.M. Varma *(Nuclear Medicine)*, J.R. Williams *(Research)*

Clinical Professors R.M. Allman, G.J. Augustin, C.V. Cimmino, J.L. Doppman, J.M. Korsower, J.G. Maier *(Radiation Oncology)*, J.J. Smith *(Nuclear Medicine)*, A.C. Wyman

* Unless otherwise indicated, all faculty appointments are in the *Diagnostic Radiology* division.

Professorial Lecturers J.R. Andrews, S.L. Brahman, J.E. Lichtenstein, L. Madewell

Associate Professors R.O. Bondelid *(Research)*, E.M. Druy, J.W. Gaskill *(Research)*, R.E. Gibson *(Research)*, D.J. Goodenough *(Radiation Physics)*, R.E. Johnsonbaugh, C.C. Ling, C.H. Paik *(Research—Nuclear Medicine)*, B.M. Potter, W.J. Rzeszotarski *(Research—Nuclear Medicine)*

Adjunct Associate Professors W.J. Bunnell, J.A. Deye *(Radiation Physics)*, G.L. Dunson

Associate Clinical Professors P.F. Abraham, L.D. Brotman, J.A. Burwell, C.M. Citrin, N.R. Dunnick, F.H. Gerber *(Nuclear Medicine)*, L.M. Glassman, J.K. Hutcheson, E.R. Jacobs, B.T. Katzen, E.V. Kotlyarov, S.N. Lee, R.J. Lull, J.D. Marriott, D.D. Maxwell, S. Mittler, C.F. Murphy, W.J. Nelson, N.G. Nolan *(Nuclear Medicine)*, B.E. Rubin, E.E. Westura

Associate Professorial Lecturers A.C. Brower, D.J. Curtis, J.A. Long, Jr.

Assistant Professors J.A. Becker, D.R. Brallier, C.A. Finder, A.N. Gulati, R.F. Kiepfer *(Nuclear Medicine)*, S.M. Levenson *(Research)*, E.R. Lipsit, B.M. Markle, G.E. Miller *(Research)*, J.I. Rich, A.J. Roach, S.N. Rustgi, P. Shapiro *(Research)*, K.E. Weaver *(Radiation Physics)*

Adjunct Assistant Professors F.B. Atkins, E.J. Banasiak, E.G. Briefel *(Radiation Physics)*, A. Castagnolo, M.L. Cianci, W.H. Farland, D. Kram, D.A. Marden, M.H. Selikson *(Radiation Physics)*

Assistant Clinical Professors A.W. Baker *(Nuclear Medicine)*, J.B. Bowers, B.G. Brotman, S.R. Brown, A.S. Cigtay, M.D.M. Faris, R.S. Frankel, N. Ghaed *(Nuclear Medicine)*, D.S. Hartman, K. Horvath-Pushkas, R.J. Kaminski, S.J. Kurzbard, A.L. Moniot *(Nuclear Medicine Technology)*, K.G. Rieth, M. Rosenstein *(Radiation Physics)*, G.S. Staples, M.A. Thomas, A.L. Tievsky, G. Tievsky, W.D. Wehunt, M.A. Weiss, J.W. Winebright *(Nuclear Medicine Technology)*, M.G. Wolfman, K.S. Yingling

Assistant Professorial Lecturer A.C. Friedman

Adjunct Instructors G.L. Colouris, G.W. Elliott, J.C. Espie IV, T.R. Fewell, G.E. Flook, M.A. Goelz, R.W. Jones, R.W. Killian, T.E. Lewis, S.M. Nichols, B.R. Rock, L.W. Treadwell, Jr., W.J. Weiler *(Nuclear Medicine)*, E.H. Whittemore

Clinical Instructors J.L. Murray, S.M. Perl, L. Wener

Special Lecturers J.W. Andrews *(Nuclear Medicine Technology)*, D.M. Barron *(Nuclear Medicine Technology)*, J.H. Coenen *(Nuclear Medicine Technology)*, D.L. Daniels *(Nuclear Medicine Technology)*, T.H. Fleckner, T.A. Peters *(Nuclear Medicine Technology)*, J.A. Stickland

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Courses numbered 40 through 190 are limited to students in the Associate in Science and Bachelor of Science degree programs in radiologic technology, nuclear medicine, and radiologic science and administration.

Gerber, Marriott

40 **Clinical Training and Experience in X-ray Technology I** (2)

Instruction and close supervision in the use of radiologic techniques to examine the digestive, urinary, female reproductive, central nervous, and circulatory systems; chest and abdomen radiography, orthopaedic radiography,

ENT and neurologic radiography, portable radiographic examinations, pediatric radiography, nuclear medicine, radiation therapy.

41 **Clinical Training and Experience in X-ray Technology II** (2) Gerber, Marriott

Prerequisite: Rad 40.

42 **Clinical Training and Experience in X-ray Technology III** (2) Gerber, Marriott

Prerequisite: Rad 40, 41.

43 **Clinical Experience in Nuclear Medicine I** (4) Reba and Staff

Practical study and supervised performance; emphasis on indications and contraindications, procedures and methods, physiological and procedural factors which may result in a false study, radiation safety techniques, preparation and development of new radiopharmaceuticals and research methodology, and administrative procedures.

44 **Clinical Experience in Nuclear Medicine II** (5) Reba

Prerequisite: Rad 43.

50 **Radiologic Anatomy I** (4) Zimmerman, Fisher

Human anatomy as applied to radiologic terminology. Structure and function of the human skeleton and topographical anatomy, both normal and pathological.

51 **Radiologic Anatomy II** (4) Zimmerman, Fisher

Human anatomy as applied to radiographic procedures. Structural and functional approach, application to radiography of the digestive, respiratory, excretory, endocrine, reproductive, and nervous systems and the organs of special sense. Some discussion of medical and surgical diseases. Prerequisite: Rad 50.

55 **Stationary and Rectilinear Imaging** (3) Alkire

Related anatomy, physiology, and pathology of imaging procedures; basic methodology of these and related procedures, including bone, brain, liver, liver function, bone marrow, lung, liver-lung, transmission, cardiac blood pool, cisternography, spleen, parathyroid, pancreas, lung ventilation, parotid ventriculography; miscellaneous scans; brain and cardiac flow studies.

56 **Hematologic and Radionuclide Dilution Procedures** (3) Alkire

Related anatomy, physiology, and pathology of hematologic and radionuclide dilution procedures; basic protocol for these procedures, including plasma volume and related plasma studies, red cell volume and related red cell studies, studies of iron metabolism, and the placental localization and scanning.

57 **Organ Concentration-Excretion Measurements** (3) Hergenrother

Related anatomy, physiology, and pathology of organ concentration-excretion measurements; the procedure for those measurements, including thyroid uptake and its variations, thyroid scan, metastatic chest survey, renogram, renal scan, and renal flow study.

58 **Gastrointestinal Absorption Measurements** (1) Weiler

Related anatomy, physiology, and pathology of gastrointestinal absorption measurements; the procedure for those measurements, including fat absorption studies (triolein and oleic acid) and the three stages of the vitamin B-12 absorption study (Schilling test).

59 **Competitive Binding Radioimmunoassay** (2) Wel

Basic concepts of radioassay; basic procedure for any competitive bindi radioassay. Specific concepts and procedure for T3, T4, and serum B- determinations; factors affecting those determinations and the interpretati of their results.

60 **Radiographic Technique I** (4) Easterbrooks, Schm

Theoretical and practical study of x-ray machines, equipment, patient po tioning, and radiographic qualities; history and development of x-ra phototiming, x-ray tubes, and Bucky grids and their uses; anatomical lan marks, radiographic terminology, exposure factors, and variations; radio graphic calibration (quality and quantity); marking of films and factor governing good film quality. Laboratory work.

61 **Radiographic Technique II** (4) Easterbrooks, Schmi

Preparation of exposure charts and use of radiation protection devices; practical applications of technical uses of stationary and portable equipmen under supervision; techniques for pediatric radiographs and methods of po sitioning and restriction; intra-oral radiography techniques. Photofluoro graphic chest units, departmental floor plans, basic office procedures. Laboratory work. Prerequisite: Rad 60.

62 **Darkroom Technology** (3) Zimmerman, Fisher

Processing of film after exposure; care and handling of conventional and automatic darkroom equipment; types of film, handling and storage; mixing and handling of chemicals and the action and quantity of these chemicals in the processing of film; effects of heat and cold on these chemicals, diagnos ing of various improper developing techniques. Laboratory work.

Weile

65 **Basic Chemistry** (3)

Introduction to basic chemistry: kinds of matter, atomic structure, the peri odic table, chemical bonding, formulae and equations, solutions, acid-base reactions; introduction to organic chemistry and biochemistry; laboratory sessions.

Weile

66 **Radiopharmaceuticals** (3)

Uses of radionuclides in medicine, basic principles of a Mo-99/Tc-99m gen erator, radiopharmaceuticals and their action within the body, preparation of radiopharmaceuticals using generator-produced nuclides, quality control, accountability, procurement, clinical orientation.

Elliot

70 **Radiographic Physics I** (4)

Fundamental concepts of physics, including standards of measure, metric measurement, laws of motion, weight, work, power, energy, and mo mentum. Introduction to structure of matter, atomic and nuclear struc ture, periodic tables, chemical bonding, material and artificial radioactivity, series decay. Description and use of electrostatics and magnetism. Labora tory work.

Elliott

71 **Radiographic Physics II** (4)

Fundamental concepts of current flow, ohms and Joule's law, series/par allel, compound circuits, battery types and functions, metering devices, electrical safety. Description and function of electromagnetism and in duction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors, applications of electronic principles to x-ray equipment and components; transformers, generators, motors, rectifiers,

current control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile x-ray units. Laboratory work.

72 **Radiation Instrumentation** (5) Alkire

Theoretical and practical aspects of radiation detectors; types, components, and operation of detectors; collimators; geometry; introduction to rectilinear scanning; introduction to stationary imaging; clinical orientation.

75 **Fundamentals of Atomic and Nuclear Physics** (3) Hergenrother

Basic units, quantum theory, Bohr theory, atomic and nuclear structure, radioactivity and decay, alpha and beta particles, electromagnetic radiation, series decay, radioactive equilibrium, I.C.R.U.

80 **Mathematics of Radiology** (3) Elliot, Schmitz

Principles of mathematics as applicable to the physics of radiologic technology; use of logarithms, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions; linear equations in the unknown; Cartesian coordinate plane; slope of straight line; linear equations from given conditions; and graphic solution of two or more linear equations.

81 **Basic Mathematics** (3) Hergenrother

Review of basic high school mathematics, basic algebra, common and natural logarithms and their manipulation, linear and logarithmic graphing and manipulation of a log-log slide rule.

82 **Applied Technical Mathematics** (3) Hergenrother

Mathematics as applicable to nuclear medicine. Basic decay formula and its variations, calculation of doses of radionuclides, basic statistics terminology, frequency distributions, confidence limits, standard error, efficient distribution of counting time, statistics relating to rectilinear and stationary imaging.

90 **Ethics** (1) Zimmerman, Fisher

Ethics of physician/technician/patient relationships. Responsibilities, both moral and legal, to physician and patient; the rapport expected of the technologist.

91 **Special Projects in Radiology** (arr.) Staff

Independent study on an aspect of radiology worked out between the student and the instructor.

92 **Basic Physics** (3) McElroy

Developmental course for students who need additional work in physics and mathematics. Basic atomic structure, practice in computation, electro and magnetic statics, motors, transformers, concepts of electricity, and circuits. Introduction to radiological physics including radiation protection, radiological units, and interactions of radiation with matter.

93 **Radiobiology and Radiation Dosimetry** (3) Weiler

Interaction of radiation with matter; radiation effects on molecular, cellular, tissue, and organ levels; genetic and somatic effects of ionizing radiation; classical and M.I.R.D. methods of absorbed dose calculation.

94 **Radiological Safety** (3) Weiler

Introduction to radiation safety; units of radiation exposure and dose; licensing; NRC regulations; accountability and records, receipt, storage, handling, transportation, and disposal of radioactive materials; monitoring;

shielding; dose-distance relationships; personnel dosimetry; radiation ... ness; radiac instruments; radiation safety clothing; radioactive "spo... procedure.

95 **Radiation Safety** (3) Jones, Mell...

Radiation tolerance, safety, and reporting photodosimetry; protective meth... ods, control devices, shielding, half-life, detection, detection equipment, de... sign and operation, thermoluminescence (its operation and uses), terminol... ogy and subject matter. Laboratory work.

96 **Radiation Biology and Survey of Radiation Therapy** (3) Stickland...

Effects of ionizing radiation on various cells, tissues, organs, and the human body as a whole; organic and inorganic molecules; the human im... munity system; effects on pregnancy and relative radiosensitivity of the developing embryo; possible genetic effects of radiation; chronic and acute effects of radiation; use and history of radiation in therapy; classification of neoplasms, types of therapy units, and treatments. Prerequisite: Rad 50, 70, 71

97 **Special Procedures** (3) Zimmerman, Fisher...

Techniques of radiology employing contrast media. Fluoroscopy, spot films, body section radiography, pelvimetry, placentography, location of foreign bodies in the eye, angiography, O.R. techniques, oral procedures, stereoscopy, pediatric angiographic procedures. Prerequisite: Rad 61, 71.

98 **Therapy Procedures** (1) Hergenrother...

Introduction to radiation therapy and radium implants. Related anatomy, physiology, and pathology of phosphorous–32 and iodine–131 therapies and the technologist's responsibilities concerning them.

99 **Alternate Imaging Systems** (3) Jones...

Various modalities of radiographic imaging systems; types of equipment and design. Intensifying screens, fluoroscopy, spot filming, image intensification, cinefluoroscopy, film changers, reproduction, polaroid imaging, thermography, ultrasound, electron radiography, computerized axial tomography, principles of nuclear medicine. Prerequisite: Rad 60, 71, and 95.

140 **Radiology Administration** (4) Bunnell...

Key areas of administration; human skills, technical skills, and conceptual awareness as they pertain to radiologic management at the department level. Traditional management concepts and models developed through model. Modern texts and current journals which address the topics of organizational behavior, planning, controlling, etc. Discussion and exploration of the logistics of managing a radiology section. Prerequisite: HCA 135, 142, 155, 156.

145 **Administrative Project: Diagnostic Radiology** (3) Bunnell...

For students concentrating in diagnostic radiology. Students identify, develop, and complete a project for a radiology department using administrative principles. Prerequisite: Rad 140.

147 **Administrative Project: Nuclear Medicine** (3) Bunnell...

For students concentrating in nuclear medicine. Students identify, develop, and complete a project for a nuclear medicine department using administrative principles. Prerequisite: Rad 140.

149 **Administrative Project: Radiation Therapy** (3) Bunnell

For students concentrating in radiation therapy. Students identify, develop, and complete a project for a radiation therapy department using administrative principles. Prerequisite: Rad 140.

150 **Radiology Senior Study** (2) Goodenough and Staff

Independent study for radiologic sciences and administration students. Faculty monitor acts as consultant to projects and gives minimal guidance. Project reports must be submitted for evaluation.

167 **Radiation Physics and Safety I** (3) Goodenough and Staff

Concepts of matter and energy and electromagnetic radiation. Mechanisms in the production of x-rays and x-ray circuits, including half-wave and full-wave rectification and three-phase generators. Interaction of radiation with matter, emphasizing the photoelectric, Compton, and pair-production effect. Radiation detection and dosimetry, Roentgen rad and rem units of radiation. Radiation safety as applied to diagnostic radiology, nuclear medicine, and radiotherapy, including effects of time, distance, and shielding. Maximum permissible concentrations, internal dose problems.

171 **Radiological Electronics and Engineering** (3) McElroy

Introduction to basic electronics and the operation, limitation, use, and principles in the selection of instrumentation. Transistors, power supplies, amplifiers, major circuit components of radiation detection instruments, gamma camera and rectilinear scanners, radiotherapy orthovoltage and linear accelerators, and diagnostic radiography equipment.

175 **Physics of Radiological Imaging** (3) Goodenough, Weaver

For students concentrating in diagnostic radiology. Image formation and transmission through radiological and related photo-optical devices, utilizing system analysis techniques. Concepts of sensitivity, contrast, and modulation transfer functions. Description and analysis of photo receptors, including film grids and Bucky and intensifier screens. Radiographic development process. Fluoroscopy, cine radiography, and video techniques; image storage electronic radiography; and solid state imaging panels. Ultra sonography and thermography. Demonstrations and experiments in control and evaluation of radiologic imaging. Prerequisite: Rad 167.

176 **Physics of Nuclear Medicine** (3) Goodenough, Briefel

For students concentrating in nuclear medicine. Concepts of radioactivity, including beta decay, isomeric transitions, electron capture, internal transition, alpha decay, and the auger effect. Isotopic half-life secular and transient equilibrium. Artificial transmutations, nuclear reactions, counting statistics, and selection of instrumentation. Scintillation spectrometry techniques. Rectilinear scanners, gamma camera, and computer technology in nuclear medicine. Demonstrations and experiments in control and evaluation of imaging. Prerequisite: Rad 167.

177 **Dosimetry in Radiation Therapy** (3) Deye, Padikal

For students concentrating in radiotherapy. Concepts of depth dose, isodose curves, and tissue air ratios for different energies, TSD, and field size. Techniques of treatment planning for stationary, multiple, and moving portals for Co-60 and megavoltage linear accelerators. Concepts of wedge fields and compensation for multiple TSD surfaces and tissue inhomogenieties. Dosimetry of linear sources. Quimby and Paterson Parker dosimetry systems. Computer techniques in radiotherapy. Introduction to the dosime-

try of electrons, neutrons, and the heavy particles. Demonstrations and e periments illustrating dosimetric principles. Prerequisite: Rad 167.

190 **Radiobiology** (2) Bradle

Advanced course in biological aspects of radiation. Chemical, physica and genetic effects of radiation on cells and organisms. Radioecology, saf ty, and health. Legal aspects of control. Prerequisite: Rad 93 or 96.

195 **Directed Study in Radiation Physics** (2) Goodenough and Staf

Projects in selected specialty demonstrating applications of radiation phy ics, imaging or dosimetric principles to radiographic quality control an evaluation of radiological equipment systems. Prerequisite: Rad 167; 17 175 or 176 or 177.

383 **Clinical Radiology** (5) Wyman and Staf

Radiologic and differential diagnosis with specific emphasis on the role o diagnostic radiology in clinical problem-solving. Each student is assigne a patient population in Medicine and Surgery, and correlates radiologi examinations with clinical manifestations of disease. Brief clinical an radiological summaries on patients may be required. Procedures, cas conferences with staff members, and interaction with medical and surgica staff. Daily lectures and departmental staff conferences. ACR Learning File and audio visual material. 4-week elective periods. Univ. Hosp.

384 **Diagnostic Radiology** (5) Burwell and Staf

Participation in general radiography, fluoroscopy, and special procedures interpretation of radiologic procedures with staff; review and study of teach ing film file. Attendance at medical, surgical, and pediatric staff confer ences. 4-week elective periods. Fairfax Hosp.

385 **Nuclear Medicine** (5) Reba and Staf

Introduction to the application of radiotracer techniques in clinical medi cine and biomedical research. Students may participate as clinical nuclear medicine interns or as research assistants. All students are encouraged to become involved with one of the research projects of the division or in an original project of their own, utilizing radiotracer techniques in an in dependent investigation oriented toward pharmaceutical chemistry, com puter applications, or patient care. 4-week elective periods. Univ. Hosp.

386 **Radiation Oncology** (5) Rogers and Staf

Introduction to high-energy radiation and principles in radiation biology. Participation in management of patients with a variety of malignant dis eases by radiotherapeutic techniques with emphasis on diagnosis and prognosis. Correlative assigned reading and seminars. 4-week elective pe riods. Univ. Hosp.

387 **Subspecialty Diagnostic Radiology** (5) Wyman and Staf

Subspecialty training in radiological diagnosis to prepare students for specialty medical training. Offerings include pulmonary, gastro-intestinal, urologic, obstetric and gynecologic, neurologic, and pediatric subspecial ties. Prerequisite: permission of department. 4-week elective periods. Univ. Hosp. Staf

389 **Diagnostic Radiology** (5)

General radiography, fluoroscopy and nuclear medicine, special pro cedures, ultrasound and/or CT. Review and study of teaching image file. 4-week elective periods. Nat'l Naval Med. Center.

390 **Extramural Radiology Elective** (arr.)

Participation in a radiology program at another institution, dependent on written acceptance of the student by the chairman of the extramural Department of Radiology and with confirmation by the Educational Director, Department of Radiology, G.W.U. Medical Center.

391 **Diagnostic Radiology** (5) Augustin and Staff

Same as Rad 389. 4-week elective periods. Wash. Hosp. Center.

392 **Diagnostic Radiology** (5) Staff

Participation in general radiologic interpretation, nuclear radiology, special procedures, ultrasound, and CT. Review and study of teaching file. Daily conferences. 4-week elective periods. Walter Reed Army Med. Center.

Surgery

Acting Chairman: N.T. Tsangaris

Director of Divisions: B.L. Aaron *(Thoracic and Cardiovascular Surgery)*, P.E. Shorb, Jr. *(General Surgery)*, J.G. Randolph *(Pediatric Surgery)*, G.S. Letterman *(Acting) (Plastic Surgery)*, J.M. Gitelman *(Oral Surgery)*

Professors R.P. Altman, L.T. Bowles, G.S. Letterman *(Plastic Surgery)*, J.G. Randolph, P.E. Shorb, Jr., N.T. Tsangaris

Clinical Professors W.J. Fouty, E.A. Gould, G.A. Higgins, N.H. Isaacson, M. Mills, J.R. Thistlethwaite, J.J. Weinstein

Associate Professors B.L. Aaron, T.C. Alford, K.D. Anderson, G.W. Geelhoed, J.M. Giordano, F.M. Midgley, H.C. Pierpont, S.A. Rosenberg, L.W. Thompson

Associate Clinical Professors F.B. Brandt, J.W. Canter, P.J. Corso, J.M. Keshishian, S.M. Kirson, M.A. Schurter, C.A. Silva, N.P.D. Smyth

Associate Professorial Lecturer L.E. Church *(Oral Surgery)*

Assistant Professors R.C. Cochran, J. Fisher, J.R. Fletcher, K.M. Grundfast, S.D. Macht, C.A. Peck, Jr., S.D. Pett, L.E. Smith, D.L. Sturtz, H.H. Trout III

Assistant Clinical Professors E.J. Alpher, J.R. Appleton, R.R. Cameron, M.H. Cohen, G.J. Collins, Jr., S.G. Crossland, R.L. Flax, B.F. Frankel *(Oral Surgery)*, G.M. Garcia, J.M. Gitelman *(Oral Surgery)*, L.W. Gray, Jr., E.D. Hanowell, I. Harrison, M.H. Jordan, S.M. Knoll, L. Kozloff, R.D. Kurstin, B.J. Levin, C.L. Magassy *(Plastic Surgery)*, J.J. O'Connor, N.A. Odyniec, L.R. Perna, F.F. Sacasa *(Oral Surgery)*, J.F. Schanno, B.S. Teunis, P. Zamick *(Plastic Surgery)*

Clinical Instructors K.F. Cheyney, P.J. Galipeau, S. Holen *(Periodontics)*, G. Rothman, J.H. Sager, R.S. Siegel *(Oral Surgery)*, J.A. Walsh

Special Lecturers J.H. Bayly, R.N. Scott

302 **Clinical Clerkship in Plastic Surgery** (3)
Two-week elective periods. Univ. Hosp.

*303 **Clinical Clerkship** (10)
Eight weeks at Univ. Hosp. and Nat'l Naval Med. Center.

376 **Advanced Surgery** (5)
Participation in total patient care, including operative procedures under close supervision. 4-week elective periods arranged at affiliated hospitals.

378 **Intensive Care Unit** (5)
Introduction to the management of acutely ill surgical patients, including cases involving trauma; neurosurgery; and cardiovascular-thoracic, abdominal, and orthopaedic surgery. 4-week elective periods. Wash. Hosp. Center.

379 **Transplantation Immunology** (5)
Clinical renal transplantation and preservation. Daily teaching rounds, literature conference, seminar presentation, weekly surgical-medical nephrology rounds. 4-week elective periods. Univ. Hosp.

382 **Hand and General Plastic Surgery** (5)
Participation in total patient care with emphasis on hand cases, but supplemented by other plastic and reconstructive cases. 4-week elective periods. Washington Hosp. Center.

383 **Endocrine Surgery** (5)
Management of endocrine disorders. Emphasis on control of hyperfunction and neoplasms of the thyroid, parathyroid, adrenal and pancreatic islet cell glands. Videotaped classic endocrine problems, library and laboratory research, and clinical exposure to surgical endocrinology. 4-week elective periods. Univ. and V.A. Hosp.

384 **Thoracic-Cardiovascular Surgery** (5)
Basic principles used in thoracic and cardiovascular surgery. 4-week elective periods. Univ. Hosp. and Clinic.

385 **Plastic and Reconstructive Surgery** (5)
Preoperative and postoperative care, operating room procedures, clinical activities, conferences. Trauma, hand surgery, congenital anomalies, neoplasms in children, head and neck cancer, maxillofacial trauma. 4-week elective periods. Children's Hosp.

386 **Pediatric Surgery** (5)
Participation in an active, closely supervised surgical service for infants and children, including congenital defects, cardiac surgery, trauma, and neoplasms. 4-week elective periods. Children's Hosp.

388 **Plastic Surgery** (5)
Participation in an active plastic surgery service, principally aesthetic surgery but also including other types of plastic surgery. Out-patient clinics, operating room procedures, and conferences. 4-week elective periods. Nat'l Naval Med. Center.

389 **Surgical Preceptorship** (5)
Care of general surgical patients as seen in private practice. 4-week elective periods.

* Required for medical students.

390 **Extramural Surgery Elective** (arr.)

The department arranges for students to spend one or more elective periods at other institutions. Students must have the approval of the chairman of the department.

391 **Special Programs** (5) Tsangaris

4-week elective periods. Univ. Hosp.

392 **Peripheral Vascular Surgery** (5) Keshishian, Smyth

Study and application of vascular surgery. 4-week elective periods. Wash. Hosp. Center.

393 **Burns** (5) Fouty

4-week elective periods.

394 **Peripheral Vascular Surgery** (5) Giordano

4-week elective periods. Univ. Hosp.

395 **Experimental Surgery** (5) Geelhoed

Research projects in surgical research laboratories employing animal models and experimental operative procedures in physiologic investigations. Emphasis on design of experiments, performance of experimental surgical techniques, precision in laboratory data gathering, and analysis of data. Areas of investigations include surgical endocrinology, transplantation and tumor immunology, shock metabolism, and gastrointestinal and cardiovascular physiology. 4-week elective periods.

396 **Peripheral Vascular Surgery** (5) Trout

4-week elective periods. VA. Hosp.

Urology

Chairman: H.C. Miller, Jr.

Professors A.B. Belman, H.C. Miller, Jr.

Clinical Professors E.E. Ferguson, F.J. Frensilli, W.D. Jarman, F.T. Reuter

Associate Professors H. Bensimon, S.A. Karmi

Associate Clinical Professors W.L. Banfield, M. Edson, H.A. Goldberg, J.C. Kenealy, A.M. Kwart, B.T. Mittemeyer, C. Rodriguez, H.S. Semerjian

Assistant Professor P.L. Gross

Assistant Clinical Professors J.B. Alperstein, M.P. Berger, G. Dudas, W.L. Glover, Jr., F.B. Hendricks, S.O. Kazmi, H.J. Klapproth, J.M. Lebowitz, G. Ottenberg, R.C. Rhame, H. Salcedo, D.T. Schwartz, D.M. Seitzman, I. Shuman, E.H. Soifer, I.J. Spence, R.E. Ware, I.S. Young

Clinical Instructors E.G. Abramson, M.E. Beall, B.O. Black, H.E. Bondy, J.D. Francis, J.A. Gargurevich, T.E. Kasper, M.I. Murdock, P.I. Shah, S.L. Werner

302 **Clinical Clerkship** (3) Miller, St

2-week elective periods. Univ. Hosp.

380 **Clinical Urology I** (5) Reut

Out-patient and diagnostic urology, cystoscopy, and radiographic proc-dures. 4-week elective periods. Univ. Hosp.

381 **Clinical Urology II** (5) Miller and St

Observation of urologic conditions and procedures for diagnosis and trea-ment; radiologic and pathologic studies, endoscopy and surgery, collater-reading, weekly staff conference. 4-week elective periods. Univ., V.A. and Children's Hosps.

382 **Clinical Urology III** (5) Hendricks and St

Observation of urologic conditions and procedures for diagnosis and trea-ment, radiologic and pathologic studies, endoscopy and surgery, collater-reading, weekly staff conference. 4-week elective periods. V.A. Hosp.

390 **Extramural Elective** (arr.)

The department may arrange for selected students to spend one or mor-elective periods at affiliated institutions: Fairfax, V.A., and Children's Hospitals. Interested students should contact the department chairman.

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES

Faculty and Staff of Instruction*

EMERITI

Theodore Judson Abernethy, *Professor Emeritus of Clinical Medicine*
B.S. 1925, Denison University; M.D. 1929, Johns Hopkins University

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Louis Katz Alpert, *Professor Emeritus of Medicine*
B.S. 1928, M.D. 1932, Yale University

William Staton Anderson, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1927, Duke University; M.D. 1931, Johns Hopkins University

Thomas McPherson Brown, *Professor Emeritus of Medicine*
B.A. 1929, Swarthmore College; M.D. 1933, Johns Hopkins University

Dexter Means Bullard, *Professor Emeritus of Clinical Psychiatry*
Ph.B. 1920, Yale University; M.D. 1923, University of Pennsylvania

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University

Jeremiah Keith Cromer, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1929, B.A. 1931, George Washington University

Leon Richard Culbertson, *Professor Emeritus of Urology*
B.S., M.D. 1936, University of Virginia

Henry Lauran Darner, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1916, Western Maryland College; M.D. 1920, Johns Hopkins University

*The Faculty and Staff of Instruction listed here and at the head of each department represents appointments current as of July, 1980. Faculty and staff members who hold appointments in two or more departments have the department of primary responsibility listed first.

Samuel Mayer Dodek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1923, George Washington University; M.D. 1927, Thomas Jefferson University; M.A. 1951, Case Western Reserve University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

James Albert Dusbabek, *Professor Emeritus of Clinical Obstetrics and Gynecology*
M.D. 1934, George Washington University

Clayton Bernard Ethridge, *Professor Emeritus of Medicine*
M.D. 1933, University of Virginia

James Joseph Feffer, *Professor Emeritus of Clinical Engineering and of Medicine*
B.A. 1935, Indiana University; M.D. 1938, Indiana University at Indianapolis

Clarence Kendall Fraser, *Professor Emeritus of Clinical Obstetrics and Gynecology*
Ph.B. 1931, College of the Holy Cross; M.D. 1935, Tufts University

James Quincy Gant, Jr., *Professor Emeritus of Clinical Dermatology*
B.A. 1930, M.S. 1931, Ohio State University; M.D. 1935, Medical College of Virginia of Virginia Commonwealth University

Robert Henry Groh, *Professor Emeritus of Clinical Neurology*
B.S. 1935, M.D. 1937, University of Pittsburgh

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Professor Emeritus of Research Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Robert Sexton Higdon, *Professor Emeritus of Dermatology and of Child Health and Development*
B.S. 1933, Millsaps College; M.D. 1937, Tulane University

Vincent Michael Iovine, *Professor Emeritus of Clinical Surgery*
B.S. 1931, Manhattan College; M.D. 1935, Columbia University

Paula Reines Kaiser, *Associate Professor Emeritus of Anesthesiology*
M.B., Ch.B. 1936, University of St. Andrews, Scotland; M.D. 1937, State University of New York

Hayden Kirby-Smith, *Professor Emeritus of Clinical Dermatology*
B.S. 1927, University of the South; M.D. 1937, George Washington University

Calvin Trexler Klopp, *Professor Emeritus of Surgery*
B.A. 1934, Swarthmore College; M.D. 1938, Harvard University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Edward Lewis, *Professor Emeritus of Clinical Pediatrics*
M.D. 1918, George Washington University

Reginald Spencer Lourie, *Professor Emeritus of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.S. 1930, Cornell University; M.D. 1936, State University of New York Downstate Medical Center; Med.Sc.D. 1941, Columbia University

Benjamin Manchester, *Professor Emeritus of Clinical Medicine*
M.D. 1935, George Washington University

Joseph Francis Ney, *Professor Emeritus of Clinical Medicine*
B.S. 1931, University of Virginia; M.D. 1935, Harvard University

Margaret Mary Nicholson, *Professor Emeritus of Clinical Pediatrics*
B.A. 1922, M.D. 1925, George Washington University

George Nordlinger, *Professor Emeritus of Clinical Obstetrics and Gynecology*
B.A. 1918, M.D. 1922, George Washington University

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.A. 1928, D.M.S. 1966, Newberry College; M.D. 1932, Medical University of South Carolina

Leonard Theodore Peterson, *Professor Emeritus of Clinical Orthopaedic Surgery*
B.A., B.S. 1928, M.D. 1931, University of Minnesota

Herbert Pollack, *Professor Emeritus of Clinical Medicine (Biochemistry)*
B.A. 1925, Washington and Lee University; M.D. 1929, Cornell University; Ph.D. 1933, University of Minnesota

Andrew Gabriel Prandoni, *Professor Emeritus of Clinical Medicine*
B.S. 1934, Fordham University; M.D. 1938, State University of New York Downstate Medical Center

Lawrence Elias Putnam, *Professor Emeritus of Clinical Medicine*
B.A. 1930, M.D. 1934, Harvard University

Mary Louise Robbins, *Professor Emeritus of Microbiology*
B.A. 1934, American University; M.A. 1940, Ph.D. 1944, George Washington University

Benjamin Rones, *Professor Emeritus of Clinical Ophthalmology*
B.A. 1922, M.D. 1926, Johns Hopkins University

Ernest Alfred Watson Sheppard, *Professor Emeritus of Clinical Ophthalmology*
M.D., C.M. 1926, Queens University, Canada

Harold Stevens, *Professor Emeritus of Neurology*
B.S. 1933, Pennsylvania State University; M.A. 1934, Ph.D. 1937, M.D. 1941, University of Pennsylvania

Donald Harrison Stubbs, *Professor Emeritus of Clinical Anesthesiology*
B.A. 1929, M.A. 1931, M.D. 1932, George Washington University

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Thomas Carlton Thompson, *Professor Emeritus of Clinical Urology*
B.S. in Med., M.D. 1920, George Washington University

Janet Graeme Travell, *Professor Emeritus of Clinical Medicine*
B.A. 1922, Wellesley College; M.D. 1926, Cornell University

Carleton Raymond Treadwell, *Professor Emeritus of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

John Augustine Washington, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1924, Virginia Military Institute; B.S. 1926, University of Virginia; M.D. 1930, Johns Hopkins University

James Winston Watts, *Professor Emeritus of Neurological Surgery*
B.S. 1924, Virginia Military Institute; M.D. 1928, University of Virginia

Richard Wallace Wilkinson, *Professor Emeritus of Clinical Ophthalmology*
B.A. 1925, M.D. 1928, George Washington University; M.S. in Med. 1932, University of Pennsylvania

Jonathan Marshall Williams, *Professor Emeritus of Clinical Neurological Surgery*
B.S. in Med. 1936, Loyola University of Chicago; M.D. 1938, University of Chicago

CTIVE

Benjamin Larry Aaron, *Associate Professor of Surgery*
B.A. 1954, University of Missouri; M.D. 1958, University of Texas Medical Branch at Galveston

Charles Owen Abernathy, *Special Lecturer in Physiology*
A.B. 1964, Asbury College; M.S. 1966, University of Kentucky; Ph.D. 1970, North Carolina State University

Andreas Andrew Abraham, *Associate Professor of Pathology*
M.D. 1953, University of Szeged, Hungary

Kristof Abraham, *Associate Clinical Professor of Neurology*
M.D. 1952, University of Budapest

Palma Feheruari Abraham, *Associate Clinical Professor of Radiology*
M.D. 1954, University of Budapest

Michael David Abramowitz, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.Ch. 1972, University of Witwatersrand, South Africa

Charles Barrett Abrams, *Assistant Clinical Professor of Medicine*
B.S. 1967, Bethany College; M.D. 1971, West Virginia University

Edward Gerald Abramson, *Clinical Instructor in Urology*
B.A. 1962, University of Pennsylvania; M.D. 1967, University of Virginia

Fred Paul Abramson, *Associate Professor of Pharmacology*
B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Richard Steeves Ackart, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1970, Butler University; M.D. 1974, Wake Forest University

John Pletch Adams, *Professor of Orthopaedic Surgery and of Child Health and Development; Chairman of the Department of Orthopaedic Surgery*
B.S. 1943, University of Missouri; M.D. 1945, Washington University

Edward Adelson, *Clinical Professor of Medicine*
B.S. 1943, M.D. 1947, Tufts University

Mohan Teckchand Advani, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, Punjab University, India; M.B., B.S. 1960, Osmani University, India; D.P.M. 1964, Mysore University, India

Lewis Francis Affronti, *Professor of Microbiology; Chairman of the Department of Microbiology*
B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

Brent Roger Ain, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1967, University of Rochester; M.D. 1972, Tulane University

Oliver Alabaster, *Associate Professor of Medicine*
M.B., B.S. 1966, University of London; M.R.C.S., L.R.C.P. 1966, Royal College of Physicians and Surgeons

Julio Estuardo Alarcon, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1966, University of Trujillo, Peru

Chalom A. Albert, *Assistant Clinical Professor of Anesthesiology*
B.A. 1949, M.D. 1953, American University of Beirut

Dan George Albert, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.S. 1938, Ohio State University; M.D. 1950, State University of New York Upstate Medical Center

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

Morris Sheldon Albert, *Assistant Clinical Professor of Child Health and Development*
B.A. 1956, Harvard University; M.D. 1960, Boston University

Solomon Naphtali Albert, *Associate Clinical Professor of Anesthesiology*
B.S. 1936, M.D. 1940, American University of Beirut

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1945, University of Baghdad; M.A. 1951, University of Texas; Ph.D. 1954, Louisiana State University

Stewart Leonard Aledort, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1958, City University of New York, Queens College; M.S. 1960, University of Connecticut; M.D. 1964, Yeshiva University

Theodore Crandall Alford, *Associate Professor of Surgery*
B.A. 1944, Haverford College; M.D. 1947, Johns Hopkins University

Frank Duane Allan, *Professor of Anatomy; Director of Audiovisual Education, Medical Center*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University

Leonard William Allen, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, City University of New York, Brooklyn College; M.A. 1953, City University of New York, City College; Ph.D. 1958, University of Denver

Robert Mayer Allman, *Clinical Professor of Radiology*
B.S. 1953, Dickinson College; M.D. 1957, Thomas Jefferson University

Melvin Gustavus Alper, *Clinical Professor of Ophthalmology and of Neurological Surgery*
B.A. 1943, M.D. 1945, University of Virginia

Joel Barry Alperstein, *Assistant Clinical Professor of Urology*
B.S. 1961, M.D. 1967, University of Maryland

Hubert Joseph Alpert, *Clinical Instructor in Medicine*
M.D. 1962, University of Illinois

Seymour Alpert, *Professor of Anesthesiology; Vice President for Development*
B.A. 1939, Columbia University; M.D. 1943, State University of New York Downstate Medical Center

Elliott Joel Alpher, *Assistant Clinical Professor of Surgery (Oral Surgery)*
B.S. 1961, University of Maryland; D.D.S. 1965, Georgetown University

Roy Peter Altman, *Professor of Surgery and of Child Health and Development*
B.A. 1955, Colgate University; M.S. 1958, University of Rochester; M.D. 1961, New York Medical College

Alice Hackney Altstatt, *Associate Professor of Anesthesiology*
B.A. 1949, Bryn Mawr College; M.A. 1952, M.D. 1956, Vanderbilt University

Bruce Leslie Ames, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, Lehigh University; M.D. 1975, University of Health Sciences/Chicago Medical School

Antonina Neri Amigable, *Assistant Professor of Medicine*
M.D. 1966, Cebu Institute of Technology, Philippines

Sirus Amiri, *Assistant Clinical Professor of Child Health and Development*
M.D. 1956, University of Tehran

Edward Stephen Amis, Jr., *Assistant Clinical Professor of Health Care Sciences*
B.S. 1963, University of Arkansas; M.D. 1967, Northwestern University

Bruce Jorge Ammerman, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1969, Case Western Reserve University; M.D. 1972, George Washington University

Harvey Hirsch Ammerman, *Clinical Professor of Neurological Surgery*
B.S. 1939, M.D. 1943, George Washington University

Richard Gene Ammerman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Yale University; M.D. 1968, Tufts University

Theodore H. Anders, *Associate Clinical Professor of Child Health and Development*
B.A. 1952, M.D. 1956, University of Rochester

Daniel Stonewall Anderson, *Assistant Clinical Professor of Health Care Sciences*
M.A. 1964, University of Oklahoma; M.D., M.S. 1972, University of Arkansas

Elizabeth Potts Anderson, *Professorial Lecturer in Biochemistry*
B.A. 1945, Sarah Lawrence College; M.S. 1947, University of Wisconsin; Ph.D. 1950, Stanford University

Frank Hughes Anderson, *Assistant Clinical Professor of Neurology*
B.A. 1966, M.D. 1970, Harvard University

James Edward Anderson, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1955, Union College, Nebraska; M.D. 1965, Loma Linda University

Kathryn Duncan Anderson, *Associate Professor of Surgery and of Child Health and Development*
B.A. 1961, M.A. 1964, Cambridge University; M.D. 1964, Harvard University

Rebecca Jane Anderson, *Associate Professor of Pharmacology*
B.A. 1971, Coe College; Ph.D. 1975, Georgetown University

J. Robert Andrews, *Professorial Lecturer in Radiology*
Ph.B. 1928, Brown University; M.D. 1932, Case Western Reserve University; D.Sc. 1946, University of Pennsylvania

Jack William Andrews, *Special Lecturer in Radiology*

E. Katherine Koehler Andrus, *Lecturer in Pathology*
B.S. 1965, Wisconsin State University

John Lawrence Angel, *Professorial Lecturer in Anatomy and in Anthropology*
B.A. 1936, Ph.D. 1942, Harvard University

Tatiana Antonovych, *Professorial Lecturer in Pathology*
M.D. 1941, University of Vienna

Leonard Philip Appel, *Clinical Instructor in Medicine*
B.A. 1953, M.D. 1957, New York University

James Richard Appleton, *Assistant Clinical Professor of Surgery (Plastic Surgery)*
B.A. 1957, University of Iowa; M.D. 1961, University of Maryland

Osbert Mark Applewhaite, *Clinical Instructor in Medicine*
B.S. 1971, Howard University; M.D. 1976, University of Pennsylvania

Marta Ewa Archutowska-Kempka, *Adjunct Instructor in Neurology*
M.D. 1971, Higher School of Medicine, Poland

Irwin Ardam, *Assistant Clinical Professor of Medicine*
B.A. 1948, New York University; M.D. 1954, New York Medical College

Bryan Arling, *Associate Clinical Professor of Medicine*
B.A. 1965, University of Minnesota; M.D. 1969, Harvard University

Mansour Farid Armaly, *Professor of Ophthalmology; Chairman of the Department of Ophthalmology*
B.A. 1947, M.D. 1952, American University of Beirut; M.S. 1957, University of Iowa

Vernon W. Armbrustmacher, *Professorial Lecturer in Neurological Surgery*
M.D. 1964, University of Michigan

Jerome Cayton Arnett, Jr., *Clinical Instructor in Health Care Sciences*
B.A. 1963, Bridgewater College; M.D. 1967, West Virginia University

Bernard Sol Arons, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1969, Oberlin College; M.D. 1973, Case Western Reserve University

Valerie Hornik Askanas, *Research Professor of Neurology*
M.D. 1960, Ph.D. 1967, Warsaw Medical School

Philip Assatourians, *Assistant Clinical Professor of Medicine*
M.D. 1964, University of Tehran

Emmanuel Atiemo, *Clinical Instructor in Obstetrics and Gynecology*
M.B., B.S. 1970, Ghana Medical School

Francis Bernard Atkins, *Adjunct Assistant Professor of Radiology*
B.S. 1968, Pratt Institute; M.S. 1971, Rutgers—The State University; Ph.D. 1978, University of Chicago

Gilbert Paul August, *Associate Professor of Child Health and Development*
B.S. 1958, City University of New York, City College; M.D. 1962, New York University

Gunter Josef Augustin, *Clinical Professor of Radiology*
M.D. 1952, University of Heidelberg

Gordon Avery, *Professor of Child Health and Development*
B.A. 1953, Harvard University; M.D. 1958, Ph.D. 1959, University of Pennsylvania

Benjamin Avrunin, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1963, Georgetown University; M.D. 1978, Tulane University

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1933, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1966, University of Chicago

Silas Babin, Jr., *Assistant Clinical Professor of Medicine*
M.D. 1951, Louisiana State University, New Orleans

Beverly T. Backus, *Assistant Research Professor of Microbiology*
B.A. 1962, University of California, Berkeley; M.S. 1967, Ph.D. 1976, George Washington University

James Michael Bacos, *Professor of Medicine*
B.S. 1948, Virginia Polytechnic Institute and State University; M.D. 1953, Duke University

Robert Emil Badwey, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1955, Franklin and Marshall College; M.D. 1959, University of Pittsburgh

Alfred Baer, *Clinical Professor of Medicine*
B.A. 1942, Ohio State University; M.D. 1945, Johns Hopkins University

George William Bailey, *Associate Professor of Health Care Sciences and of Child Health and Development*
B.A. 1963, Birmingham Southern College; M.D. 1967, University of Alabama in Birmingham

John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

William Otis Bailey, Jr., *Associate Clinical Professor of Medicine*
M.D. 1940, George Washington University

Alton Wade Baker, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*
B.A. 1964, David Lipscomb College; M.D. 1967, Medical College of Virginia of Virginia Commonwealth University

William Prentice Baker, *Professor of Medicine*
B.S. 1949, Indiana University; M.S. 1953, Ph.D. 1955, Michigan State University; M.D. 1959, University of Michigan

Guillermo Alfredo Balfour, *Associate Clinical Professor of Child Health and Development*
M.D. 1959, University of Buenos Aires

Eugene Joseph Banasiak, *Adjunct Assistant Professor of Radiology*
B.S. 1971, Rutgers—The State University

Bernard Alvin Band, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1952, B.S. 1954, George Washington University; M.D. 1959, Howard University

William Landon Banfield III, *Associate Clinical Professor of Urology*
B.A. 1954, Princeton University; M.D. 1958, George Washington University

Herbert Stuart Block Baraf, *Assistant Clinical Professor of Medicine*
B.S. 1969, University of Michigan; M.D. 1973, State University of New York Downstate Medical Center

Joseph R. Baranski, *Adjunct Assistant Professor of Microbiology*

Joan Barber, *Associate Professor of Psychiatry and Behavioral Sciences*
B.A. 1946, Wellesley College; M.D. 1949, Cornell University

Lewellys Franklin Barker, *Associate Clinical Professor of Medicine*
B.A. 1955, Princeton University; M.D. 1959, Johns Hopkins University

Ann Birnbaum Barnet, *Associate Professor of Neurology and of Child Health and Development*
B.A. 1951, Sarah Lawrence College; M.D. 1956, Harvard University

Ida Sue Baron-Starke, *Assistant Professor of Neurological Surgery and of Child Health and Development*
B.S. 1968, Cornell University; M.A. 1972, Ph.D. 1976, University of Maryland

Walter Erik Barquist, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, George Washington University; M.D. 1969, New York University

Norman Lee Barr, Jr., *Associate Clinical Professor of Otolaryngology*
B.A. 1959, Princeton University; M.D. 1965, Georgetown University

Solomon Efrem Barr, *Associate Clinical Professor of Medicine*
B.A. 1951, M.D. 1954, George Washington University

John William Barrett, *Assistant Clinical Professor of Neurological Surgery*
M.D. 1958, George Washington University

Danny Michael Barron, *Special Lecturer in Radiology (Nuclear Medicine Technology)*

Robert Henry Barter, *Professor of Obstetrics and Gynecology*
B.S. 1937, M.D. 1940, University of Wisconsin

Robert Lewis Barth, *Adjunct Assistant Professor of Anesthesiology*
B.A. 1966, Yale University; M.D. 1970, University of Pennsylvania

Werner Franklin Barth, *Professor of Medicine*
B.A. 1956, Columbia University; M.D. 1960, Yeshiva University

Ronald Stephen Bashian, *Assistant Clinical Professor of Child Health and Development*
B.A. 1968, Amherst College; M.D. 1972, State University of New York Downstate Medical Center

Constance Urciolo Battle, *Professor of Child Health and Development*
B.A. 1963, Trinity College, District of Columbia; M.D. 1967, George Washington University

John Henry Bayly, *Special Lecturer in Surgery and in Child Health and Development*
B.S. 1936, Rensselaer Polytechnic Institute; M.D. 1940, Georgetown University

Michael Edgar Beall, *Clinical Instructor in Urology*
B.A. 1968, Ohio Wesleyan University; M.D. 1972, George Washington University

Barbara Louise Bean, *Assistant Professor of Pharmacology*
B.S. 1970, University of Surrey; Ph.D. 1976, University of London

Lillian McLean Beard, *Assistant Clinical Professor of Child Health and Development*
B.S. 1965, M.D. 1970, Howard University

Harry Carl Beaver, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1959, Wheaton College; M.D. 1963, George Washington University

Arthur Abbe Becker, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, City University of New York, City College; M.D. 1961, University of Iowa

Joan Alaine Becker, *Assistant Professor of Radiology (Allied Health)*
B.S. 1976, Ohio State University

Kenneth Louis Becker, *Professor of Medicine*
B.A. 1952, University of Michigan; M.D. 1956, New York Medical College; Ph.D. 1963, University of Minnesota

Matthew Joseph Becker, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1971, Massachusetts Institute of Technology; M.D. 1974, Duke University

Edward Arthur Beeman, *Assistant Clinical Professor of Medicine*
B.A. 1943, Harvard University; M.D. 1947, Boston University; M.S. 1956, University of Minnesota

Gustavo Sastrano Belaval, *Associate Clinical Professor of Medicine*
M.D. 1942, George Washington University

Samuel Michael Belinsky, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1955, University of Bridgeport; M.D. 1959, George Washington University

A. Barry Belman, *Professor of Urology and of Child Health and Development*
B.A. 1960, University of Arizona; M.D. 1964, M.S. 1969, Northwestern University

Carol Laura Bender, *Clinical Instructor in Medicine*
B.S. 1965, Cornell University; M.A. 1966, Columbia University; M.D. 1972, State University of New York Upstate Medical Center

Ruth Boschwitz Benedict, *Associate Clinical Professor of Medicine*
B.A. 1935, Wellesley College; M.D. 1939, New York University

Howard Jay Bennett, *Assistant Professor of Health Care Sciences and of Child Health and Development*
B.S. 1972, University of Maryland; M.D. 1977, George Washington University

Linda Anne Marshall Bennett, *Assistant Research Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, Clarion State College; M.A. 1966, Indiana University; Ph.D. 1976, American University

Hector Bensimon, *Associate Professor of Urology*
M.D. 1946, Buenos Aires Medical School

Luis Felipe Bentolila, *Assistant Clinical Professor of Medicine*
M.D. 1967, University of Buenos Aires

Robert Allen Berenson, *Assistant Clinical Professor of Medicine and of Health Care Sciences*
B.A. 1968, Brandeis University; M.M.S. 1970, Rutgers—The State University; M.D. 1972, City University of New York, Mount Sinai School of Medicine

Myron Paul Berger, *Assistant Clinical Professor of Urology*
B.S. 1960, M.D. 1964, Georgetown University

Eric Charles Bergman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1968, Duke University; M.D. 1973, University of Pennsylvania

Gary Jay Bergman, *Clinical Instructor in Child Health and Development*
B.A. 1972, State University of New York at Binghamton; M.D. 1976, City University of New York, Mount Sinai School of Medicine

Sanders Harris Berk, *Assistant Clinical Professor of Dermatology, of Medicine, and of Child Health and Development*
B.S. 1965, M.D. 1969, University of Maryland

David Kip Berler, *Assistant Clinical Professor of Ophthalmology*
B.A. 1955, M.D. 1958, Cornell University

Cheston Milton Berlin, Jr., *Special Lecturer in Child Health and Development*
B.A. 1958, Haverford College; M.D. 1962, Harvard University

Sidney Berman, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1928, M.D. 1932, Georgetown University

Howard Nathan Bernstein, *Assistant Clinical Professor of Ophthalmology*
B.S. 1953, Bucknell University; M.D. 1957, State University of New York Downstate Medical Center

Jerald Jack Bernstein, *Research Professor of Neurological Surgery and of Physiology*
B.A. 1955, City University of New York, Hunter College; M.S. 1957, Ph.D. 1959, University of Michigan

John David Berryman, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1962, Swarthmore College; M.S. 1964, Case Western Reserve University; M.D. 1967, University of Virginia

Stephen Charles Beuttel, *Special Lecturer in Health Care Sciences*
B.S. 1967, Wake Forest University; M.D. 1971, Duke University

Christopher Theodore Bever, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1940, M.D. 1943, Harvard University

Lewis Henry Biben, *Assistant Clinical Professor of Medicine*
M.D. 1949, Hahnemann Medical College

Charles Joel Bier, *Assistant Clinical Professor of Medicine*
B.A. 1965, M.D. 1968, George Washington University

Sanford Louis Billet, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1947, New York University; M.D. 1951, University of Cincinnati

Audrey Thayer Billett, *Adjunct Associate Professor of Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1957, Wheaton College; M.S.S. 1959, Smith College

Helga Wagner Binder, *Assistant Professor of Child Health and Development*
M.D. 1957, Humboldt University, Germany

Philip Stanley Birnbaum, *Professor of Health Services Administration and of Health Care Sciences; Dean of the Medical Center, for Administrative Affairs*
B.S. in M.E. 1948, M.S. in M.E. 1949, Carnegie-Mellon University; B.C.E 1954, Rensselaer Polytechnic Institute

Kathleen Bis, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1968, M.D. 1972, George Washington University

Calvin Franklin Bishop, *Clinical Professor of Pathology (Laboratory Medicine)*
B.S. 1950, Baylor University; M.D. 1953, University of Texas, Southwestern Medical School at Dallas

Barbara Onderchek Black, *Clinical Instructor in Urology*
B.A. 1962, Trinity College, District of Columbia; M.D. 1966, Georgetown University

Edward Black, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1959, Dickinson College; M.D. 1963, New York Medical College

Emilie Annabelle Black, *Adjunct Instructor in Child Health and Development*
B.S. 1942, M.D. 1945, George Washington University

Brian Douglas Blackbourne, *Associate Clinical Professor of Pathology (Forensic Pathology)*
M.D. 1962, University of Alberta

Jeffrey David Blake, *Special Lecturer in Child Health and Development*
B.A. 1967, Cornell University; M.M.S. 1969, Rutgers—The State University; M.D. 1971, City University of New York, Mount Sinai School of Medicine

Benjamin Cael Blatt, *Assistant Professor of Health Care Sciences and of Medicine*
A.B. 1966, Tufts University; M.A. 1968, Brandeis University; M.D. 1972, Medical College of Virginia of Virginia Commonwealth University

Vay John Blazina, *Assistant Clinical Professor of Neurology*
B.A. 1963, University of Washington; M.D. 1967, George Washington University

Sherman Bloom, *Professor of Pathology*
B.A. 1955, M.D. 1960, New York University

Robert Joel Bobys, *Assistant Clinical Professor of Otolaryngology*
M.D. 1963, Georgetown University

Roger Louis O. Boeckx, *Assistant Professor of Child Health and Development*
B.S. 1968, Ph.D. 1973, University of Winnipeg

George Pierce Bogumill, *Adjunct Associate Professor of Orthopaedic Surgery*
B.S. 1952, M.S. 1954, Ph.D. 1955, M.D. 1959, University of Wisconsin

Lawrence David Bohan, *Assistant Professor of Medicine*
B.A. 1958, Boston College; M.D. 1962, Tufts University

Jean Crowell Bolan, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1972, M.D. 1976, University of North Carolina

Rollon Oscar Bondelid, *Associate Research Professor of Radiology*
B.S. 1945, University of North Dakota; M.S. 1948, Ph.D. 1950, Washington University

Harold Eugene Bondy, *Clinical Instructor in Urology*
B.S. 1965, Fairmont State College; M.D. 1969, West Virginia University

Wynona Gottlieb Boren, *Assistant Professor of Health Care Sciences*
B.A. 1970, M.S.W. 1972, University of Maryland

Mary Ann Borengasser, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1968, University of Arkansas; Ph.D. 1974, University of Tennessee

David Gilbert Borenstein, *Assistant Professor of Medicine*
B.A. 1969, Columbia University; M.D. 1973, Johns Hopkins University

John Andrew Bottiglione, *Special Lecturer in Child Health and Development*
B.S. 1958, University of Notre Dame; M.D. 1962, Seton Hall University

John Henry Bouma, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1948, B.S. 1949, M.B. 1952, M.D. 1953, University of Minnesota

Maxwell Boverman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1938, University of California, Berkeley; M.D. 1942, University of California, San Francisco

Joel Bruce Bowers, *Assistant Clinical Professor of Radiology*
B.A. 1965, University of Vermont; M.D. 1969, State University of New York at Buffalo

Timothy Keefe Bowers, *Assistant Clinical Professor of Medicine*
B.S. 1965, M.D. 1968, West Virginia University

Lawrence Thompson Bowles, *Professor of Surgery; Dean of the Medical Center for Academic Affairs*
B.A. 1953, M.D. 1957, Duke University; M.S. 1964, Ph.D. 1971, New York University

Eileen Walkavich Bradley, *Research Professor of Radiology*
B.A. 1966, Anna Maria College for Women; M.S. 1968, Sc.D. 1971, Harvard University

Sherry Lee Brahman, *Professorial Lecturer in Radiology*
B.A. 1966, Andrews University; M.D. 1970, Loma Linda University

David Ronald Brallier, *Assistant Professor of Radiology and of Child Health and Development*
B.S. 1964, University of Minnesota; M.D. 1968, University of Iowa

Carl David Brandt, *Associate Professor of Child Health and Development (Microbiology)*
B.S. 1949, University of Connecticut; M.S. 1951, University of Massachusetts; Ph.D. 1958, Harvard University

Frederick Bertram Brandt, *Associate Clinical Professor of Surgery*
B.S. 1942, M.D. 1943, University of Maryland

Martin Braun III, *Associate Professor of Dermatology and of Medicine*
M.D. 1970, University of Maryland

M. Eduardo Bravo, *Assistant Clinical Professor of Child Health and Development*
B.S., M.D. 1966, Peruvian University

Gloria Godbey Brennan, *Associate Clinical Professor of Pathology*
B.A. 1949, M.D. 1952, George Washington University

Ellen Gundersheim Briefel, *Adjunct Assistant Professor of Radiology (Radiation Physics)*
B.S. 1967, University of Rochester; M.S. 1969, Yale University; Ph.D. 1976, Brandeis University

Milton Wilfred Brightman, *Professorial Lecturer in Anatomy*
B.S. 1945, M.A. 1948, University of Toronto; Ph.D. 1954, Yale University

Warren Daniel Brill, *Associate Clinical Professor of Medicine*
B.S., M.D. 1944, University of Maryland

LeRoy Brodie, *Special Lecturer in Health Care Sciences*

David Michael Brody, *Associate Clinical Professor of Orthopaedic Surgery*
B.A. 1956, Harvard University; M.D. 1961, University of Virginia

Itzhak Brook, *Assistant Clinical Professor of Child Health and Development*
M.D. 1969, Hebrew University; M.S. 1973, Tel Aviv University

Barry G. Brotman, *Assistant Clinical Professor of Radiology*
B.A. 1967, M.D. 1971, State University of New York at Buffalo

Lawrence Daniel Brotman, *Associate Clinical Professor of Radiology*
M.D. 1964, University of Michigan

Anne Clayton Brower, *Associate Professorial Lecturer in Radiology*
B.A. 1960, Smith College; M.D. 1964, Columbia University

Bertram Brown, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, City University of New York, Brooklyn College; M.D. 1956, Cornell University; M.P.H. 1960, Harvard University

Crawford Southwell Brown, *Clinical Professor of Dermatology*
B.A. 1946, Kenyon College; M.D. 1948, University of Michigan

Nigel Andrew Brown, *Assistant Professor of Pharmacology*
B.S. 1973, University of Leeds; Ph.D. 1977, University of Surrey

Stanton R. Brown, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*
B.A. 1958, Rutgers—The State University; M.D. 1962, Hahnemann Medical College

Blackwell Smith Bruner, *Clinical Instructor in Ophthalmology and in Child Health and Development*
M.D. 1963, George Washington University

Philip Craig Brunschwyler, *Associate Clinical Professor of Child Health and Development*
B.A. 1951, West Virginia University; M.D. 1955, University of Maryland

Robert Wesley Bryant, Jr., *Assistant Research Professor of Biochemistry*
B.S. 1966, State University of New York, College of Environmental Science and Forestry; Ph.D. 1973, Florida State University

Peter Alexander Bryce, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1974, Howard University

James Carroll Bulger, *Assistant Professorial Lecturer in Obstetrics and Gynecology*
B.S. 1950, D.D.S. 1955, M.D. 1961, University of Maryland

William Joseph Bunnell, *Adjunct Associate Professor of Radiology*
B.S. 1969, Ball State University; M.S. 1970, University of Cincinnati

James Matthew Burgin, *Assistant Clinical Professor of Child Health and Development*
B.A. 1962, Haverford College; M.D. 1966, Columbia University

Barrett Lewis Burka, *Assistant Clinical Professor of Medicine*
B.S. 1963, American University; M.D. 1973, Howard University

William Wesley Burr, Jr., *Professorial Lecturer in Biochemistry (Isotopes)*
B.A. 1947, University of Nebraska; M.S. 1948, Ph.D. 1951, University of Illinois; M.D. 1960, University of Texas, Southwestern Medical School at Dallas

Boyd Lee Burris, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1952, University of Tennessee

Bruce Don Burtoff, *Clinical Instructor in Otolaryngology*
B.A. 1970, University of Pennsylvania; M.D. 1974, George Washington University

James Burwell, *Associate Clinical Professor of Radiology*
B.A. 1952, University of Pittsburgh; M.D. 1956, University of Maryland

Robert Neil Butler, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1949, M.D. 1953, Columbia University

Edward Bernard Byrd, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1963, M.D. 1965, George Washington University

Carmen V. A. Cabrera, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1932, University of Puerto Rico; M.A. in S.W. 1944, University of Chicago

Juan Bautista Calatayud, *Associate Clinical Professor of Medicine*
M.D. 1952, University of Valencia, Spain

Carol Sheppard Camerini-Otero, *Assistant Professor of Child Health and Development*
B.A. 1966, Barnard College; M.D. 1970, New York University

Ronald Ross Cameron, *Assistant Clinical Professor of Surgery*
B.A. 1953, Johns Hopkins University; M.D. 1957, University of Maryland

Jerome Wolf Canter, *Associate Clinical Professor of Surgery*
M.D. 1955, George Washington University

Helen Diana Capone, *Assistant Clinical Professor of Medicine*
M.D. 1951, University of Ottawa

David Roland Carlson, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1953, Drake University; M.D. 1960, George Washington University

Thomas Grant Carlton, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1966, San Jose State University; M.D. 1970, University of Wisconsin

David Orlo Carpenter, *Professorial Lecturer in Physiology*
B.A. 1959, M.D. 1964, Harvard University

Charles Patrick Henry Carroll, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1952, Boston College; M.D. 1961, Georgetown University

Edward C. Cartwright, *Assistant Clinical Professor of Medicine*
B.A. 1968, Oakwood College; M.D. 1972, Yale University

David Thornhill Casey, *Assistant Clinical Professor of Ophthalmology*
B.S. 1960, University of Pittsburgh; M.D. 1964, Hahnemann Medical College

Harold Wilton Casey, *Clinical Professor of Pathology (Comparative Pathology)*
B.S. 1954, D.V.M. 1957, University of Missouri; M.P.H. 1958, Tulane University; Ph.D. 1965, University of California, Davis

Marie Mullaney Cassidy, *Professor of Physiology*
B.S. (General) 1957, B.S. (Special) 1958, M.S. 1959, Ph.D. 1962, National University of Ireland

Antoinette Castagnolo, *Adjunct Assistant Professor of Radiology*

Donald Castell, *Professor of Medicine*
B.A. 1958, M.D. 1960, George Washington University

Robert Lewis Castle, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1969, College of Wooster; M.D. 1976, George Washington University

Rosella Decena Castro, *Assistant Professor of Child Health and Development*
B.A. 1959, Philippine Union College; M.D. 1964, Manila Central University

Hereward Seagrieve Cattell, *Adjunct Assistant Professor of Orthopaedic Surgery*
B.A. 1954, Amherst College; M.D. 1958, University of Rochester

Marvin Chadab, *Assistant Clinical Professor of Dermatology*
B.A. 1968, City University of New York, Brooklyn College; M.D. 1972, Yeshiva University

William Paxson Chalfant, Jr., *Assistant Clinical Professor of Ophthalmology*
M.D. 1934, Hahnemann Medical College

Morris Jay Chalick, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

John Loomis Chamberlain III, *Associate Clinical Professor of Child Health and Development*
B.S. 1953, Amherst College; M.D. 1957, University of Virginia

Lorraine Anne Ashley Champion, *Assistant Professor of Child Health and Development*
B.S. 1967, M.B., Ch.B. 1971, Edinburgh University

Roma Sakhuja Chandra, *Associate Professor of Pathology and of Child Health and Development*
M.B., B.S. 1958, Lady Hardinge Medical College, India

Philippe Ernest Chanel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1970, University of Lausanne, Switzerland

Charles Shih-Cheng Chang, *Assistant Professor of Neurology and of Child Health and Development*
B.A. 1967, M.D. 1972, Johns Hopkins University

Margan Jamieson Chang, *Assistant Professor of Child Health and Development*
B.A. 1967, Johns Hopkins University; M.D. 1971, University of Maryland

Paul P.L. Chang, *Assistant Clinical Professor of Medicine*
M.D. 1959, National Taiwan University; M.P.H. 1976, Johns Hopkins University

Robert Merritt Chanock, *Professor of Child Health and Development*
B.S. 1945, M.D. 1947, University of Chicago

David Charney, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1964, City University of New York, Brooklyn College; M.D. 1968, State University of New York Upstate Medical Center

Kenneth Herbert Chase, *Assistant Clinical Professor of Medicine*
B.A. 1964, M.D. 1968, University of California, Los Angeles

Mark Russell Chassin, *Assistant Clinical Professor of Medicine*
B.A. 1968, M.D., M.Pub.Pol. 1973, Harvard University; M.P.H. 1978, University of California, Los Angeles

C. Terrence Chastek, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1973, State University of New York Upstate Medical Center

John Charles Chatel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, George Washington University; M.D. 1965, Creighton University

Irene Minna Chatoor-Koch, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1965, Heidelberg University, Germany

Richard Martin Chavis, *Adjunct Assistant Professor of Ophthalmology*
B.A. 1965, M.S. 1967, Rutgers—The State University; M.D. 1971, University of Missouri

Tsung O. Cheng, *Professor of Medicine*
B.S. 1947, M.D. 1950, St. John's University, China; M.S. 1956, University of Pennsylvania

Viola Wai Chiu Cheng, *Assistant Professor of Child Health and Development*
M.D. 1961, National Taiwan University

Judith Mendlowitz Chertoff, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1966, Brown University; M.D. 1976, City University of New York, Mount Sinai School of Medicine

Kathleen Frances Cheyney, *Clinical Instructor in Surgery*
A.B. 1970, Ohio Wesleyan University; M.D. 1974, Thomas Jefferson University

Cecilin Chisholm, *Assistant Clinical Professor of Child Health and Development*
B.S. 1963, M.D. 1967, Howard University

Wu Shung Chiu, *Associate Professor of Medicine*
M.D. 1959, National Taiwan University

Diane Camille Tate Choate, *Associate Professor of Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1968, M.S.W. 1970, University of Oklahoma

Paul Chodoff, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1934, University of Pennsylvania; M.D. 1938, Thomas Jefferson University

Byung-Il Choi, *Clinical Instructor in Medicine*
M.D. 1965, Severance Medical College, Korea

Yang-Ming Chu, *Associate Research Professor of Microbiology*
B.S. 1959, University of Washington; M.S. 1964, Ph.D. 1967, George Washington University

Domingo Chua, *Clinical Instructor in Health Care Sciences*
M.D. 1962, University of Santo Tomas, Manila

Francis Chucker, *Assistant Clinical Professor of Medicine*
M.D. 1957, Marquette University

Lloyd Eugene Church, *Associate Professorial Lecturer in Surgery (Oral Surgery)*
B.A. 1942, West Virginia University; D.D.S. 1944, University of Maryland; M.S. 1951, Ph.D. 1959, George Washington University

Judith Ann Fingert Chused, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Wellesley College; M.D. 1967, Harvard University

Michael Louis Cianci, *Adjunct Assistant Professor of Radiology*
B.S. 1968, University of Scranton

Attila Sakir Cigtay, *Assistant Clinical Professor of Radiology*
M.D. 1956, Istanbul University, Turkey

Christian Virgil Cimmino, *Clinical Professor of Radiology*
B.A. 1937, Harvard University; M.D. 1941, Johns Hopkins University

Dianne Cresswell Cinnamon, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1968, Muskingum College; M.D. 1973, George Washington University

Mark Ira Cinnamon, *Assistant Clinical Professor of Medicine*
B.A. 1968, Ohio State University; M.D. 1972, State University of New York Downstate Medical Center

Richard Francis Cioffi, *Assistant Clinical Professor of Medicine*
B.A. 1962, College of the Holy Cross; M.D. 1966, College of Medicine and Dentistry of New Jersey

Charles Michael Citrin, *Associate Clinical Professor of Radiology*
B.A. 1966, Indiana University; M.D. 1970, State University of New York Downstate Medical Center

Margaret Mary Clancy, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1969, Fordham University; M.D. 1973, Georgetown University

Thomas Harding Clark, *Clinical Instructor in Medicine*
B.S. 1970, M.D. 1974, George Washington University

James McClay Close, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1951, Virginia Military Institute; M.D. 1955, University of Maryland

Charles Seymour Coakley, *Professor of Anesthesiology; Chairman, Department of Anesthesiology*
M.D. 1937, George Washington University

Gloria Grimes Cochran, *Associate Clinical Professor of Child Health and Development*
B.S. 1945, M.D. 1949, Duke University

Robert Carter Cochran, *Assistant Professor of Surgery*
B.A. 1955, Princeton University; M.D. 1960, Boston University

Joseph Henry Coenen, *Special Lecturer in Radiology*

George Joel Cohen, *Associate Professor of Child Health and Development*
M.D. 1950, George Washington University

Lawrence Franklin Cohen, *Assistant Clinical Professor of Child Health and Development*
A.B. 1968, Dartmouth College; M.D. 1972, Duke University

Martin Herbert Cohen, *Associate Professor of Medicine*
B.S. 1960, City University of New York, Queens College; M.D. 1964, New York University

Max Harry Cohen, *Assistant Clinical Professor of Surgery*
B.A. 1961, Columbia University; M.D. 1965, Harvard University; Ph.D. 1970, George Washington University

Philip Cohen, *Associate Professor of Medicine*
B.A. 1966, Columbia University; M.D. 1970, Harvard University

Victor Hugo Cohn, Jr., *Professor of Pharmacology*
B.S. 1952, Lehigh University; M.A. 1954, Harvard University; Ph.D. 1961, George Washington University

Allan Bertram Coleman, *Clinical Professor of Child Health and Development*
M.D. 1943, George Washington University

Raymond Hugh Coleman, *Assistant Clinical Professor of Child Health and Development*
B.S. 1969, M.D. 1973, Tufts University

Roy Melvin Coleman, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Harvard University; M.D. 1959, University of Rochester

Stanford Joseph Coleman, Jr., *Clinical Instructor in Child Health and Development*
B.S. 1970, Howard University; M.D. 1975, Stanford University

George James Collins, Jr., *Assistant Clinical Professor of Surgery*
B.S. 1961, M.S. 1963, Texas A&M University; M.D. 1966, University of Texas

George Lee Colouris, *Adjunct Instructor in Radiology (Nuclear Medicine Technology)*

Willard Frederick Conger, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, M.D. 1974, University of Pennsylvania

Nathaniel Thomas Connally, *Clinical Instructor in Health Care Sciences and in Medicine*
B.A. 1958, M.D. 1962, University of Virginia

Carmen Keith Conners, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development and Research Professor of Neurology*
B.A. 1953, University of Chicago; M.A. 1955, Oxford University, England; Ph.D. 1960, Harvard University

Thomas Martin Connor, *Assistant Clinical Professor of Child Health and Development*
B.S. 1961, St. Francis College; M.D. 1966, University of Bologna, Italy

Louis Robert Conte, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1961, Johns Hopkins University

Guido Controni, *Assistant Clinical Professor of Pathology*
B.S. 1955, University of Panama; M.S. 1959, Florida State University

Charles Barrie Cook, *Clinical Professor of Pathology*
B.S. 1945, Hampden-Sydney College; M.D. 1948, George Washington University

Thomas Alfred Cook, Jr., *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1949, University of Virginia

Stewart Dallas Cooley, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1957, Ohio State University; M.D. 1961, University of Cincinnati

Francis Donald Cooney, *Associate Clinical Professor of Neurological Surgery*
B.S. 1959, King's College, Pennsylvania; M.D. 1963, University of Pittsburgh

Antonio Alvarez Cooper, *Special Lecturer in Pathology*
B.S. 1972, Howard University

Wayne Douglas Cooper, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1969, Alfred University; M.D. 1973, George Washington University

William Hurlbert Cooper, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1946, Case Western Reserve University; M.D. 1949, George Washington University

Bruce Allen Copeland, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1969, University of Rochester; Ph.D. 1974, University of Vermont

Francis Henry Corcoran, *Assistant Professor of Medicine*
M.D. 1962, St. Louis University

Paul Joseph Corso, *Associate Clinical Professor of Surgery*
B.A. 1966, M.D. 1969, George Washington University

Erminio Costa, *Professorial Lecturer in Pharmacology*
M.D. 1947, University of Cagliari, Italy

Ronald Michael Costell, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, M.A., M.D. 1967, Stanford University

Elaine Wolf Cotlove, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, Columbia University; M.D. 1944, New York University

Laurence Ari Cove, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1955, Columbia University; M.D. 1959, State University of New York Downstate Medical Center

Pamela DeGraaf Cowell, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1969, Kalamazoo College; M.D. 1975, Emory University

Patrick Anthony Coyne, *Clinical Instructor in Otolaryngology and in Child Health and Development*
B.A. 1962, Josephinum College; M.D. 1971, Hahnemann Medical College

John Brown Craft, Jr., *Professor of Anesthesiology and of Obstetrics and Gynecology*
B.A. 1959, Johns Hopkins University; M.D. 1963, Georgetown University

Neil Allan Crane, *Assistant Clinical Professor of Medicine*
B.S.E. 1961, Princeton University; M.D. 1965, Washington University

Elizabeth Amanda Crisp, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1943, Texas Woman's University; M.D. 1950, Louisiana State University in New Orleans

William Holmes Crosby, *Adjunct Professor of Medicine*
A.B. 1936, M.D. 1940, University of Pennsylvania

Stanley Gramch Crossland, *Assistant Clinical Professor of Surgery*
B.S. 1967, University of Richmond; M.D. 1971, George Washington University

Jack Crowell, *Assistant Clinical Professor of Medicine*
B.S. 1947, M.D. 1951, George Washington University

Edward Earl Cunningham, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1952, Washington and Jefferson College; M.S. 1954, Duquesne University; M.D. 1960, George Washington University

James Allen Curtin, *Professor of Medicine*
B.A. 1946, Canisius College; M.D. 1950, State University of New York at Buffalo

David J. Curtis, *Associate Professorial Lecturer in Radiology*
A.B. 1967, Dartmouth College; M.D. 1971, University of Colorado

Gilbert Bernard Cushner, *Assistant Clinical Professor of Medicine*
M.D. 1958, University of Maryland

Leonard Dean Cutler, *Assistant Clinical Professor of Dermatology*
B.A. 1965, M.D. 1969, University of Maryland

Leon Cytryn, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1951, University of Marburg

Carol Lynne Czerwinski, *Assistant Professorial Lecturer in Pathology (Laboratory Medicine)*
B.S. 1968, M.S. 1970, Marquette University; Ph.D. 1973, Georgetown University

Angelo D'Agostino, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1945, St. Michael's College; M.D. 1949, M.S. 1953, Tufts University

Gordon Walford Daisley, Jr., *Assistant Clinical Professor of Child Health and Development*
B.A. 1946, Dartmouth College; M.D. 1948, George Washington University

Charles Edward Daniels, *Special Lecturer in Pathology*

Douglas Lawrence Daniels, *Special Lecturer in Radiology (Nuclear Medicine Technology)*
B.S. 1969, University of Texas at El Paso

Abraham Wolffe Danish, *Associate Clinical Professor of Medicine*
B.A. 1938, M.D. 1941, George Washington University

Stuart Henry Danovitch, *Clinical Professor of Medicine*
B.A. 1957, Harvard University; M.D. 1960, Northwestern University

Michael William Datch, *Clinical Instructor in Child Health and Development*
B.A. 1962, Washington and Jefferson College; M.D. 1966, George Washington University

Donald William Datlow, *Clinical Instructor in Medicine*
B.S. 1952, M.S. 1954, George Washington University; M.D. 1960, University of Maryland

Linda Kay Davies, *Assistant Professor of Health Care Sciences*

Christopher James Davis, *Assistant Professor of Health Care Sciences (Emergency Medicine) and of Medicine*
B.S. 1968, Massachusetts Institute of Technology; M.D. 1972, George Washington University

David Oliver Davis, *Professor of Radiology and of Neurology; Chairman, Department of Radiology*
B.S. 1954, University of Illinois; M.D. 1958, St. Louis University

Donald Irvin Davis, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Harvard University; M.D. 1968, University of Pennsylvania

Gilla Prizant Davis, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, B.Sc.M. 1973, M.D. 1975, Northwestern University

Kathleen Kingsford Davis, *Assistant Professor of Health Care Sciences and of Medicine*
A.B. 1968, Wellesley College; M.D. 1977, George Washington University

Miryam Maltinskis Davis, *Assistant Clinical Professor of Neurology and of Child Health and Development*
M.D. 1957, University of Buenos Aires

Robert Day, *Assistant Clinical Professor of Ophthalmology*
B.A. 1936, Harvard University; M.D. 1943, Johns Hopkins University

Ruth Elizabeth Dayhoff, *Research Instructor in Pathology*
B.S. 1973, University of Maryland; M.D. 1977, Georgetown University

Robert Neal DeAngelis, *Assistant Clinical Professor of Dermatology*
M.D. 1968, Medical College of Virginia of Virginia Commonwealth University

Rosalie De Giovanni-Donnelly, *Associate Professorial Lecturer in Microbiology*
B.A. 1947, M.A. 1953, City University of New York, Brooklyn College; Ph.D. 1961, Columbia University

Ronald Stuart Deitch, *Clinical Instructor in Ophthalmology*
B.A. 1954, Washington and Lee University; M.D. 1958, George Washington University

Adrian Joseph Delaney, Jr., *Assistant Professor of Anesthesiology and of Child Health and Development*
B.A. 1968, George Washington University; D.O. 1972, Kirksville College of Osteopathic Medicine

Donald William Delaney, *Professor of Child Health and Development*
B.S. 1949, St. Michael's College; M.D. 1954, Georgetown University

Morgan Dennis Delaney, *Assistant Professor of Medicine*
B.A. 1967, M.D. 1971, University of Virginia

Nancy Baker Delston, *Adjunct Instructor in Psychiatry and Behavioral Sciences*
B.A. 1972, George Washington University; M.S.W. 1973, Catholic University of America

Armando Antonio DeMoya, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1960, Wake Forest University

Michael William Dennis, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1965, Brown University; M.D. 1969, Yale University

Kenneth Andre De Sandies, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1969, Hampton Institute; M.D. 1973, Meharry Medical College

Raylene Ann De Vine-Curcio, *Clinical Instructor in Child Health and Development*
M.D. 1968, Howard University

Vincent Theodore De Vita, *Professor of Medicine*
B.S. 1957, College of William and Mary; M.D. 1961, George Washington University

Donald Wilson Dew, *Associate Research Professor of Medicine*
B.S. 1964, University of Baltimore; M.S. 1970, Virginia Commonwealth University; Ed.D. 1976, American University

James Alan Deye, *Adjunct Associate Professor of Radiology (Radiation Physics)*
B.A. 1965, Thomas More College; M.S. 1969, Ph.D. 1970, Vanderbilt University

Evans Diamond, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1956, Brown University; M.D. 1960, University of Pennsylvania

Maria Joaquina Diaz, *Lecturer in Pathology*
B.S. 1967, American University

Giovanni Di Chiro, *Clinical Professor of Neurological Surgery*
M.D. 1949, University of Naples

Kenneth James Dickie, *Associate Professor of Medicine*
M.D. 1963, University of Toronto

Richard Adolph Di Gioia, *Assistant Clinical Professor of Medicine*
A.B. 1966, Columbia University; M.D. 1970, Washington University

Joseph Amedeo Di Paolo, *Associate Professorial Lecturer in Anatomy*
B.A. 1948, Wesleyan University; M.S. 1949, Case Western Reserve University; Ph.D. 1951, Northwestern University

Sebastian James Dispenza, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1974, University of Virginia

Andrew Ivo Dobranski, *Assistant Clinical Professor of Orthopaedic Surgery (Anatomy)*
M.D. 1954, Medical Academy of Warsaw

Oscar Irving Dodek, Jr., *Clinical Professor of Obstetrics and Gynecology and of Biochemistry*
B.A. 1956, University of Michigan; M.D. 1956, George Washington University

Herenia Isabel Osma Doerr, *Lecturer in Pathology (Laboratory Medicine)*
B.S. 1953, Indiana University

Howard Alexander Donald, *Clinical Professor of Obstetrics and Gynecology*
M.D. 1939, George Washington University

Molla Sloane Donaldson, *Assistant Research Professor of Health Care Sciences*
B.A. 1966, Wellesley College; M.S. 1970, University of Virginia

Kathy Sue Doner, *Assistant Clinical Professor of Health Care Sciences and of Medicine*
B.S. 1970, Stetson University; M.P.H. 1972, University of Michigan; M.D. 1976, George Washington University

Orville Wright Donnelly, *Associate Clinical Professor of Medicine*
B.A. 1943, Swarthmore College; M.S. 1951, M.D. 1957, George Washington University

John Leo Doppman, *Clinical Professor of Radiology*
B.A. 1949, College of the Holy Cross; M.D. 1953, Yale University

Paul Austin Dorn, Jr., *Clinical Instructor in Ophthalmology*
B.A. 1953, St. Anselm's College; M.D. 1965, Georgetown University

Stefan Dosa, *Assistant Professor of Medicine (Renal Diseases)*
M.D. 1967, J.E. Purkyne University, Czechoslovakia; M.R.C.P. 1974, Royal College of Physicians, London

Ira Dosovitz, *Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, M.D. 1974, University of Pennsylvania

Beverly Goode Douglas, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1968, M.S. 1968, Purdue University; M.D. 1975, University of Louisville

Robert LeRoy Dow, *Associate Clinical Professor of Orthopaedic Surgery*
B.A. 1944, M.D. 1948, Cornell University

Spyros Doxiadis, *Visiting Professor of Child Health and Development*
M.B. 1940, M.D. 1943, University of Athens

Brian Bowles Doyle, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, Harvard University; M.D., C.M. 1966, McGill University

Mary Joy Drass, *Assistant Professor of Medicine*
B.S. 1969, Duquesne University; M.D. 1973, Georgetown University

Edward Martin Druy, *Associate Professor of Radiology*
B.A. 1964, Brown University; M.D. 1968, Yale University

George Dudas, *Assistant Clinical Professor of Urology*
M.D. 1952, University of Budapest

Virginia Duggins, *Assistant Clinical Professor of Neurology*
B.A. 1942, Sweet Briar College; M.A. 1951, M.D. 1955, George Washington University

Gary Wayne Dumas, *Special Lecturer in Health Care Sciences*

Burdett Sheridan Dunbar, *Professor of Anesthesiology and of Child Health and Development*
B.S. 1960, M.D. 1963, University of Illinois

Cheryl T. Dunn, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1967, M.D. 1972, University of Oregon

Rosalie Ann Dunn, *Associate Research Professor of Clinical Engineering*
B.A. 1962, M.A. 1965, Ph.D. 1967, Catholic University of America

Nicholas Reed Dunnick, *Associate Clinical Professor of Radiology*
B.S. 1965, Purdue University; M.D. 1969, Cornell University

George Lee Dunson, *Adjunct Associate Professor of Radiology*
B.S. 1956, University of Florida; M.S.P.H. 1969, University of North Carolina

Thomas Patrick Dwyer, *Assistant Clinical Professor of Medicine*
B.S. 1954, Boston College; M.D. 1958, Tufts University

Robert Francis Dyer, *Assistant Clinical Professor of Medicine; Associate University Physician*
B.A. 1951, University of Michigan; M.D. 1955, George Washington University

Noel Kennedy Dysart, Jr., *Assistant Clinical Professor of Health Care Sciences*
B.A. 1967, M.D. 1970, University of Minnesota

Anne Elizabeth Eager, *Clinical Instructor in Ophthalmology*
M.D. 1967, Georgetown University

Lawrence Joseph Eanet, *Associate Clinical Professor of Dermatology*
B.A. 1952, Harvard University; M.D. 1956, George Washington University

Kenneth Martin Earle, *Professorial Lecturer in Neurological Surgery*
B.A. 1942, Rice University; M.D. 1945, University of Texas Medical Branch at Galveston; M.S. 1951, McGill University

Calvin Buddy Early, *Associate Professor of Neurological Surgery*
B.S. 1952, U.S. Coast Guard Academy; B.A. 1957, M.D. 1960, Ph.D. 1967, Ohio State University

William Charles Eckelman, *Professor of Radiology (Nuclear Medicine)*
B.S. 1963, St. Louis University; M.A. 1966, Ph.D. 1968, Washington University

Henry Dunlop Ecker, *Clinical Professor of Medicine*
B.S. 1936, M.D. 1940, University of Virginia

Basil Elias Economopoulos, *Assistant Clinical Professor of Anesthesiology*
M.D. 1962, National University of Athens, Greece

George Themistocles Economos, *Assistant Clinical Professor of Medicine; Associate University Physician*
M.D. 1949, University of Athens; M.D. 1954, University of Vermont

Richard Nathan Edelson, *Assistant Clinical Professor of Neurology*
B.A. 1963, Dartmouth College; M.D. 1966, Harvard University

Sol S. Edelstein, *Associate Professor of Health Care Sciences and of Anesthesiology*
B.S. 1968, M.D. 1972, Wayne State University

Deborah Susan Edge, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1970, Tufts University; M.D. 1974, Northwestern University

Craig Edmonds, *Clinical Instructor in Ophthalmology*
A.B. 1964, Harvard University; M.D. 1969, Columbia University

Mitchell Edson, *Associate Clinical Professor of Urology*
B.S. 1949, U.S. Merchant Marine Academy; M.A. 1952, Columbia University; M.D. 1956, Yale University

Maureen Crittenden Edwards, *Associate Professor of Child Health and Development and of Obstetrics and Gynecology*
B.S. 1966, Marquette University; M.D. 1970, George Washington University

James Harold Egan, *Associate Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1960, College of William and Mary; M.D. 1964, Columbia University

Bernard Ehrlich, *Clinical Instructor in Ophthalmology*
B.S. 1952, M.B., B.Surg. 1956, Durham University

Wilfred Russell Ehrmantraut, *Assistant Clinical Professor of Health Care Sciences and of Medicine*
B.S. 1948, University of Maryland; M.D. 1952, George Washington University

Daniel Ein, *Associate Clinical Professor of Medicine*
B.A. 1959, Columbia University; M.D. 1964, Yeshiva University

Arnold H. Einhorn, *Professor of Child Health and Development*
B.A. 1942, University of Montpellier; M.D. 1954, University of Paris

Norman Zelig Einstein, *Assistant Professor of Health Care Sciences and of Medicine*
B.A. 1969, Rutgers—The State University; M.D. 1973, Tufts University

Sanford Harold Eisenberg, *Assistant Clinical Professor of Orthopaedic Surgery*
M.D. 1942, State University of New York Downstate Medical Center

Rona Copen Eisner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Smith College; Ph.D. 1967, New York University

Mervyn Elgart, *Professor of Dermatology, of Child Health and Development, and of Medicine; Chairman of the Department of Dermatology*
B.A. 1953, City University of New York, Brooklyn College; M.D. 1957, Cornell University

Gary Wayne Elliott, *Adjunct Instructor in Radiology*

Rodney Lane Ellis, *Clinical Instructor in Medicine*
B.S. 1970, Howard University; M.D. 1975, Stanford University

Janice Joy Emery, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1970, M.D. 1975, University of Iowa

March Enders, *Assistant Professor of Medicine*
B.A. 1951, Oberlin College; M.D. 1960, Yale University

Gloria Donna Eng, *Professor of Child Health and Development and of Medicine*
M.D. 1955, Marquette University

Milton Engel, *Associate Professorial Lecturer in Psychiatry and Behavioral Sciences and in Child Health and Development*
B.A. 1956, Harvard University; M.D. 1960, Yeshiva University

William King Engel, *Clinical Professor of Neurology*
B.A. 1951, Johns Hopkins University; M.D. 1955, McGill University

Francis Anthony Ennis, *Clinical Professor of Medicine*
A.B. 1960, Boston College; M.D. 1964, Tufts University

William Francis Enos, *Associate Clinical Professor of Pathology*
B.A. 1942, Dartmouth College; M.D. 1945, State University of New York Downstate Medical Center

Burton Seymour Epstein, *Professor of Anesthesiology and of Child Health and Development*
B.A. 1954, M.D. 1957, George Washington University

Stephen Epstein, *Associate Clinical Professor of Otolaryngology*
B.A. 1960, New York University; M.D. 1964, University of Health Sciences/Chicago Medical School

James Bernard Erdmann, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Pontifical College Josephinum; M.A. 1964, Ph.D. 1966, Loyola University of Chicago

Mary Frances Kelly Ericksen, *Assistant Professorial Lecturer in Anatomy*
B.A. 1947, Indiana University; M.A. 1957, Columbia University; Ph.D. 1973, George Washington University

Dennis Duane Erickson, *Lecturer in Pathology*
B.S. 1974, St. Cloud State University

Richard Vernon Erkenbeck, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1952, University of Maryland; M.D. 1956, George Washington University

John Clark Espie IV, *Adjunct Instructor in Radiology (Nuclear Medicine Technology)*

Delbert Eugene Evans, *Associate Professor of Neurological Surgery*
B.A. 1963, Columbia Union College; M.S. 1966, American University; Ph.D. 1973, Georgetown University

James Lawrence Evans, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Middlebury College; M.D. 1961, Thomas Jefferson University

John McCallum Evans, *Professor of Medicine*
B.A. 1935, Denison University; M.D. 1939, State University of New York at Buffalo

Richard Evans III, *Associate Clinical Professor of Child Health and Development and of Medicine*
B.A. 1957, Colorado College; M.D. 1961, University of Colorado

Christian Mbamalu Ezekwueche, *Clinical Instructor in Obstetrics and Gynecology*
M.B., B.S. 1971, University of Ibadan, Nigeria

Sergio Egidio Fabro, *Professor of Obstetrics and Gynecology and Research Professor of Pharmacology*
M.D. 1956, University of Milan; Ph.D. 1966, Ph.D. 1968, University of Rome; Ph.D. 1967, University of London

David Nathaniel Fox Fairbanks, *Clinical Professor of Otolaryngology*
B.S. 1960, M.D. 1963, University of Utah

Nancy Ellen Smolen Falk, *Assistant Clinical Professor of Medicine*
B.A. 1967, University of Massachusetts; M.D. 1971, State University of New York Downstate Medical Center

Joseph Leon Falkson, *Associate Professorial Lecturer in Health Care Sciences*
B.A. 1964, Brandeis University; M.A. 1965, Ph.D. 1971, University of Michigan

Mary Huey Wei Fang, *Assistant Clinical Professor of Medicine*
B.S. 1971, University of Maryland; M.D. 1974, Medical College of Virginia of Virginia Commonwealth University

Marion Dees Miller Faris, *Assistant Clinical Professor of Radiology*
B.A. 1943, Queens College, North Carolina; M.N. 1945, Case Western Reserve University; M.D. 1950, University of Virginia

William Harry Farland, *Adjunct Assistant Professor of Radiology*
B.S. 1970, Loyola University of Los Angeles; M.A. 1972, Ph.D. 1976, University of California, Los Angeles

Richard Lee Fassett, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1961, M.D. 1961, Ohio State University

Henry Leon Feffer, *Professor of Orthopaedic Surgery*
B.A. 1939, Indiana University; M.D. 1942, Indiana University at Indianapolis

Carl Bruce Feinstein, *Associate Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1963, University of Chicago; M.D. 1968, State University of New York Downstate Medical Center

Morris Feitel, *Clinical Professor of Child Health and Development*
M.D. 1957, George Washington University

Bruce Allen Feldman, *Associate Clinical Professor of Otolaryngology*
B.A. 1962, B.Med.S. 1963, Dartmouth College; M.D. 1965, Harvard University

Douglas Edward Feldman, *Clinical Instructor in Otolaryngology*
A.B. 1970, B.M.S. 1971, Dartmouth College; M.D. 1973, Harvard University

Melvin Louis Feldman, *Assistant Clinical Professor of Child Health and Development*
B.S. 1960, George Washington University; M.D. 1964, University of Vermont

William Robert Felts, Jr., *Professor of Medicine*
B.S. 1944, M.D. 1946, University of Arkansas

Joseph Fenton, *Associate Clinical Professor of Medicine (Clinical Psychology)*
B.S. 1938, M.A. 1939, New York University; Ed.D. 1952, Columbia University

Leslie Howard Fenton, *Assistant Clinical Professor of Medicine*
M.D. 1959, University of London

Edward Egner Ferguson, *Clinical Professor of Urology*
M.D. 1936, George Washington University

Edward Joseph Feroli, *Special Lecturer in Child Health and Development*
B.S. 1955, Massachusetts College of Pharmacy; B.S. 1956, Tufts University; M.D. 1960, George Washington University

Richard Alan Ferreras, *Assistant Professor of Health Care Sciences and of Medicine*
B.S. 1971, Union College, New York; M.D. 1975, State University of New York at Buffalo

Louis Earl Fettig, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1943, Pennsylvania State University; M.D. 1947, Hahnemann Medical College

Thomas Ray Fewell, *Adjunct Instructor in Radiology*
B.S. 1958, Berry College; M.S. 1961, Emory University

Marc I. Fialco, *Clinical Instructor in Obstetrics and Gynecology*
A.B. 1961, Ohio University; M.D. 1965, University of Cincinnati

Annette Heiser Ficker, *Assistant Professor of Child Health and Development*
B.A. 1965, Trinity College, District of Columbia; M.D. 1969, St. Louis University

Stuart Michael Fidler, *Assistant Clinical Professor of Medicine*
B.A. 1963, Cornell University; M.D. 1967, State University of New York Upstate Medical Center

Alan Fields, *Associate Professor of Anesthesiology and of Child Health and Development*
M.D. 1970, State University of New York Downstate Medical Center

Charles Arthur Finder, *Assistant Professor of Radiology*
B.S. 1972, State University of New York at Stony Brook; M.D. 1975, Loyola University of Chicago

Ben Sion Fine, *Associate Research Professor of Ophthalmology*
M.D. 1953, University of Toronto

Robert Joseph Fink, *Assistant Professor of Child Health and Development*
B.S. 1970, University of Michigan; M.D. 1974, Case Western Reserve University

James David Finkelstein, *Professor of Medicine*
B.A. 1954, Harvard University; M.D. 1958, Columbia University

Frank Ambrose Finnerty, *Clinical Professor of Medicine*
B.A. 1943, M.D. 1947, Georgetown University

Harvey Bernard Firestone, *Special Lecturer in Health Care Sciences*
B.A. 1968, John Carroll University; M.A. 1971, Cleveland State University

Karla Helen Fischer, *Assistant Professor for Allied Health in Pathology*
B.S. 1966, Vermont College

Max Fischer, *Associate Clinical Professor of Otolaryngology and of Child Health and Development*
M.D. 1946, Georgetown University

Robert Andrew Fischer, *Associate Clinical Professor of Medicine*
B.A. 1954, Columbia University; M.D. 1958, Cornell University

Jack Fisher, *Assistant Professor of Surgery*
B.S. 1969, University of Illinois; M.D. 1973, Emory University

Donald Jay Fishman, *Associate Clinical Professor of Neurology and of Child Health and Development*
B.S. 1956, M.D. 1959, University of Illinois

Peter Harvey Fishman, *Professorial Lecturer in Biochemistry*
B.S. 1961, Massachusetts Institute of Technology; M.S. 1967, Ph.D. 1970, George Washington University

Alf Lee Fjordbotten, *Assistant Clinical Professor of Ophthalmology*
M.D. 1944, University of Alberta

Richard Leroy Flax, *Assistant Clinical Professor of Surgery*
B.S. 1962, M.D. 1966, University of Maryland

Theodore Hugo Fleckner, *Special Lecturer in Radiology (Radiologic Technology)*

David Elliot Fleischer, *Assistant Professor of Medicine*
B.S. 1966, Washington and Lee University; M.D. 1970, Vanderbilt University

Anne Bosshard Fletcher, *Associate Professor of Child Health and Development*
B.A. 1960, Clark University; M.D. 1964, Washington University

John Raymond Fletcher, *Assistant Professor of Surgery*
B.S. 1962, Southern Methodist University; M.D. 1964, Washington University

Mary Ann Fletcher, *Assistant Professor of Child Health and Development and of Obstetrics and Gynecology*
B.S. 1965, University of Puget Sound; M.D. 1969, Washington University

Gary Edward Flook, *Adjunct Instructor in Radiology*

Eleanor Coloma Flores, *Assistant Professor of Medicine*
M.D. 1962, University of Santo Tomas, Philippines

Julius Fogel, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1937, University of Virginia

John Nathan Follansbee, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1957, U.S. Military Academy; M.D. 1964, Cornell University

Marvin Peace Footer, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1938, M.D. 1942, George Washington University

Janice Elena Forey, *Lecturer in Pathology*
B.A. 1970, San Jose State University

Judith Ann Hood Forgotson, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Washington University; M.D. 1961, University of Rochester

David Forman, *Assistant Professorial Lecturer in Physiology*
B.A. 1964, Harvard University; Ph.D. 1971, Rockefeller University

Ulla M-Son Fortune, *Associate Clinical Professor of Orthopaedic Surgery*
M.D. 1965, George Washington University

William Patrick Fortune, *Professor of Orthopaedic Surgery and of Medicine*
B.S. 1953, Springfield College; M.D. 1965, George Washington University

Byron Earl Fossieck, Jr., *Associate Professor of Medicine*
B.A. 1961, Drury College; M.D. 1965, Northwestern University

William Joseph Fouty, *Clinical Professor of Surgery*
B.S. 1952, M.D. 1957, Ohio State University

Karyle Zeffie Fowler, *Clinical Instructor in Child Health and Development*
B.S. 1964, M.D. 1968, Howard University

Mary Ruth Johns Fox, *Assistant Clinical Professor of Child Health and Development*
M.D. 1967, State University of New York Upstate Medical Center

Samuel Mickle Fox III, *Professorial Lecturer in Medicine*
B.A. 1944, Haverford College; M.D. 1947, University of Pennsylvania

William Charles Fox, *Special Lecturer in Pathology*

Daniel Francis Fragnul, *Assistant Professor of Medicine*
M.D. 1950, University of Padua, Italy

David Hirsch Fram, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1963, Yale University

Jack David Francis, *Clinical Instructor in Urology*
B.A. 1965, M.D. 1968, George Washington University

John Joseph Francis, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1937, M.D. 1940, Vanderbilt University

Arthur Frank, *Assistant Clinical Professor of Medicine*
B.S. 1956, Massachusetts Institute of Technology; M.S. 1958, University of Pennsylvania; M.D. 1962, New York University

Colin Frank, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1966, Columbia University; M.S. 1969, Ph.D. 1971, University of Oklahoma

Justin Arthur Frank, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, University of California, Berkeley; M.D. 1968, University of Louisville

Martin Frank, *Associate Professorial Lecturer in Physiology*
A.B. 1969, M.S. 1971, Ph.D. 1973, University of Illinois

Randolph Adams Frank, *Assistant Clinical Professor of Psychiatry and Beh ioral Sciences*
B.A. 1946, M.D. 1948, Vanderbilt University

Bennett Frank Frankel, *Assistant Clinical Professor of Surgery (Oral Surg*
D.M.D. 1967, University of Pennsylvania

Bernard Leonard Frankel, *Associate Professor of Psychiatry and Behavio Sciences and of Medicine*
B.S. 1963, City University of New York, City College; M.D. 1967, Yeshiva University

Robert Saul Frankel, *Assistant Clinical Professor of Radiology*
B.A. 1966, Washington and Jefferson College; M.D. 1970, Case Western Reserve University

Stephen Bovee Fredd, *Assistant Clinical Professor of Medicine*
B.A. 1955, Princeton University; M.D. 1959, New York University

Calvin Jefferson Frederick, *Clinical Professor of Psychiatry and Behavior Sciences (Medical Psychology)*
B.F.A. 1940, University of Oklahoma; M.A. 1954, Ph.D. 1955, University of California, Los Angeles

Donald Sharp Fredrickson, *Professorial Lecturer in Medicine*
B.S. 1946, M.D. 1949, University of Michigan

George Richard Freeland, *Assistant Clinical Professor of Health Care Scienc*
B.S. 1967, Ursinus College; M.D. 1971, Thomas Jefferson University

Frederick John Frensilli, *Clinical Professor of Urology*
B.A. 1957, College of the Holy Cross; M.D. 1961, Georgetown University

Thomas Frey, *Assistant Clinical Professor of Ophthalmology and of Chil Health and Development*
B.A. 1955, M.D. 1958, Northwestern University

William Andrew Fried, *Clinical Instructor in Child Health and Development*
B.A. 1972, State University of New York at Buffalo; M.D. 1976, University of Pennsylvania

Adolph Friedman, *Assistant Clinical Professor of Medicine*
B.A. 1939, University of Pennsylvania; M.D. 1943, Thomas Jefferson University

Arnold C. Friedman, *Assistant Professorial Lecturer in Radiology*
B.A. 1972, Cornell University; M.D. 1975, Yeshiva University

Arnold Jay Friedman, *Assistant Professor of Obstetrics and Gynecology*
B.A. 1969, City University of New York, Queens College; M.D. 1973, New York University

Herbert N. Friedman, *Assistant Professor of Medicine*
B.A. 1971, M.D. 1975, University of Maryland, Baltimore

Joseph Marshall Friedman, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1936, M.D. 1939, George Washington University

Leonard Malcolm Friedman, *Clinical Instructor in Ophthalmology*
B.A. 1965, University of Pennsylvania; M.D. 1969, George Washington University

Sarah Landau Friedman, *Assistant Clinical Professor of Psychiatry and Be havioral Sciences and of Child Health and Development*
B.A. 1968, Hebrew University of Jerusalem; M.A. 1971, Cornell University; Ph.D. 1975, George Washington University

David Stern Friendly, *Associate Professor of Ophthalmology and of Child Health and Development*
B.A. 1954, Carleton College; M.D. 1958, Columbia University

Agnes Gordon Sampson Fry, *Assistant Research Professor of Medicine*
B.S. 1943, Madison College

Marvin Fuchs, *Clinical Professor of Medicine*
B.S. 1941, City University of New York, City College; M.D. 1944, New York University

Curt Daniel Furberg, *Assistant Professorial Lecturer in Medicine*
M.D. 1963, University of Umea, Sweden

Kenneth Ray Gaarder, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1954, University of Minnesota

Grace Priscilla Gabe, *Assistant Clinical Professor of Neurology and of Psychiatry and Behavioral Sciences*
B.A. 1955, Radcliffe College; M.D. 1959, Boston University

Richard Leo Gaertner, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1961, Pennsylvania State University; M.D. 1965, Temple University

Brian Joseph Gaffney, *Assistant Professor of Medicine*
B.S. 1968, Georgetown University; M.D. 1972, State University of New York Upstate Medical Center

Edward Elias Gahres, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1950, Rutgers—The State University; M.S. 1951, George Washington University; M.D. 1958, University of Virginia

Dorothy Berlin Gail, *Assistant Research Professor of Medicine*
B.A. 1966, City University of New York, Hunter College; M.A. 1968, Boston University; Ph.D. 1973, Georgetown University

Allen Gaisin, *Assistant Clinical Professor of Dermatology and of Child Health and Development*
B.A. 1968, Temple University; M.D. 1972, Hahnemann Medical College

Juarlyn Lucille Gaiter, *Assistant Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1969, Eckerd College; M.A. 1971, Ph.D. 1973, Brown University

Frank Martin Galioto, *Associate Professor of Child Health and Development*
B.A. 1964, Cornell University; M.D. 1968, New York Medical College

Philip Joseph Galipeau, *Clinical Instructor in Surgery (Oral Surgery)*
B.S. 1968, Stone Hill College; D.D.S. 1971, Georgetown University

Linda Lou Gallo, *Associate Professor of Biochemistry*
B.S. 1959, West Virginia University; M.S. 1963, Ph.D. 1969, George Washington University

Jorge Mance Garcia, *Assistant Clinical Professor of Surgery*
M.D. 1964, University of Santo Tomas, Philippines

Francisco Jose Garcia-Torres, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1967, Loyola University in New Orleans; M.D. 1971, Thomas Jefferson University

David John Gardner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1957, Atlantic Union College; M.D. 1961, Loma Linda University

Sheryl Paige Gardner, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1967, M.D. 1971, University of Oregon

J. Antonio Gargurevich, *Clinical Instructor in Urology*
M.D. 1966, Cayetano Heredia University, Peru

Bruce Neil Garrett, *Assistant Professor of Medicine*
B.S. 1969, Dickinson College; M.D. 1973, Medical College of Pennsylvania

Carleton Theodore Garrett, *Associate Professor of Pathology*
B.A. 1962, Lehigh University; M.D. 1966, Johns Hopkins University; Ph.D. 1977, University of Wisconsin

Margaret Lucretia Garrett, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1952, Bucknell University; M.D. 1956, University of Pennsylvania

Ronald J. Garson, *Assistant Clinical Professor of Psychiatry and Behavi Sciences*
B.A. 1971, Columbia University; M.D. 1974, University of Pennsylvania

Jerry William Gaskill, *Associate Research Professor of Radiology*
B.A. 1963, Oberlin College; M.A. 1967, M.Phil. 1970, M.S.A. 1975, George Washin University

Joe Harvey Gaskin, *Associate Professor of Medicine*
B.S. 1956, Davidson College; M.D. 1960, University of Pennsylvania

Ronald DeVoe Gaskins, *Assistant Professor of Medicine*
B.S. 1958, College of Charleston; M.D. 1962, Medical University of South Carolina

Paul Theodore Gavaris, *Assistant Clinical Professor of Ophthalmology*
B.S. 1961, Rutgers—The State University; M.D. 1968, George Washington University

Adi F. Gazdar, *Adjunct Associate Professor of Pathology*
M.B., B.S. 1961, University of London

Glenn William Geelhoed, *Associate Professor of Surgery*
B.A. 1964, B.S. 1965, Calvin College; M.D. 1968, University of Michigan

Leon Paul Georges, *Assistant Professor of Medicine*
B.A. 1958, New York University; B.M.S. 1960, M.D. 1963, University of Geneva

Frederic Hanford Gerber, *Associate Clinical Professor of Radiology (Nucle Medicine)*
B.A. 1957, Cornell University; M.D. 1965, Duke University

Richard Borisow Gerber, *Assistant Clinical Professor of Psychiatry and Be havioral Sciences*
B.A. 1965, Amherst College; M.D. 1969, Harvard University

Stanley George Gerding, *Special Lecturer in Pathology*

Barton Jerome Gershen, *Associate Clinical Professor of Medicine*
B.S. 1954, M.D. 1957, University of Vermont

Nasser Ghaed, *Assistant Clinical Professor of Radiology*
M.D. 1963, Shiraz Medical School, Iran

Kamal Ghaemi, *Clinical Instructor in Neurological Surgery*
M.D. 1955, Tehran University

Raymond Edward Gibson, *Associate Research Professor of Radiology*
B.A. 1969, University of California at Santa Cruz; Ph.D. 1972, University of California a Santa Barbara

Charles Richard Alsop Gilbert, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1944, University of Virginia

William Steven Gilbert, *Associate Clinical Professor of Ophthalmology*
B.A. 1957, Cornell University; M.D. 1961, Yeshiva University

Martin Giller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1962, M.D. 1966, Georgetown University

David Leonard Gilligan, *Special Lecturer in Health Care Sciences*

John Christian Gillin, *Professorial Lecturer in Physiology*
B.A. 1961, Harvard University; M.D. 1966, Case Western Reserve University

Robert David Gillman, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1939, Mus.B. 1940, Yale University; M.A. 1945, Columbia University; M.D. 1950, George Washington University

Barbara Ellen Gilson, *Assistant Professor of Anatomy*
B.A. 1968, Temple University; Ph.D. 1975, Thomas Jefferson University

Allen Louis Ginsberg, *Associate Professor of Medicine*
B.A. 1962, Princeton University; M.D. 1966, Johns Hopkins University

Joseph Martin Giordano, *Associate Professor of Surgery*
B.A. 1963, Georgetown University; M.D. 1967, Thomas Jefferson University

Jeffrey Michael Gitelman, *Assistant Clinical Professor of Surgery (Oral Surgery)*
D.D.S. 1971, Howard University

Allen Martin Glasgow, *Associate Professor of Child Health and Development*
B.S. 1963, Hampden-Sydney College; M.D. 1967, University of Virginia

David Roger Glass, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, University of Michigan; M.A. 1974, Ph.D. 1978, University of California, Los Angeles

Leonard Mark Glassman, *Associate Clinical Professor of Radiology*
B.S. 1967, Pennsylvania State University; M.D. 1969, Thomas Jefferson University

Milton Sanford Glatt, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1946, Johns Hopkins University; M.D. 1951, University of Geneva

William Bainbridge Glew, *Assistant Clinical Professor of Ophthalmology*
B.S. 1950, Yale University; M.D. 1953, George Washington University; M.S. 1957, University of Minnesota

William Lloyd Glover, Jr., *Assistant Clinical Professor of Urology*
B.S. 1962, M.D. 1965, University of Tennessee

Rita Sue Kaplan Gluck, *Assistant Professor of Child Health and Development*
B.A. 1968, New York University; M.D. 1974, George Washington University

Alan E. Gober, *Clinical Instructor in Child Health and Development*
B.A. 1970, Western Maryland College; M.D. 1974, University of Maryland

Ira David Godwin, *Associate Clinical Professor of Pathology*
B.S. 1952, M.D. 1955, University of North Carolina

Michael Anthony Goelz, *Adjunct Instructor in Radiology*

Harvey Robert Gold, *Associate Clinical Professor of Child Health and Development*
B.A. 1956, Lafayette College; M.D. 1960, State University of New York Upstate Medical Center

Michael Stephen Gold, *Associate Professor of Medicine*
B.A. 1959, Harvard University; M.D. 1963, State University of New York Downstate Medical Center

Carl Goldberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, American International College; M.A. 1961, University of Wyoming; Ph.D. 1966, University of Oklahoma

Herbert Abraham Goldberg, *Associate Clinical Professor of Urology*
M.D. 1935, University of St. Andrews, Scotland

Samuel David Goldberg, *Assistant Clinical Professor of Medicine*
B.A. 1965, Franklin and Marshall College; M.D. 1969, University of Maryland

Marianne Rudolf Goldberger, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1953, Radcliffe College; M.D. 1958, New York University

Stephen Gilbert Goldberger, *Assistant Clinical Professor of Medicine*
B.S. 1964, University of Florida; M.D. 1968, University of Mississippi, Jackson

Ralph Goldman, *Clinical Professor of Medicine*
A.B. 1939, M.D. 1942, University of California, Berkeley

Allan L. Goldstein, *Professor of Biochemistry; Chairman of the Department of Biochemistry*
B.S. 1959, Wagner College; M.S. 1961, Ph.D. 1964, Rutgers—The State University

Howard David Goldstein, *Assistant Professor of Health Care Sciences and Medicine*
B.S. 1971, State University of New York at Stony Brook; M.D. 1976, New York University

Howard Seth Goldstein, *Assistant Clinical Professor of Medicine*
B.A. 1967, Colgate University; M.D. 1971, George Washington University

Kenneth Goldstein, *Associate Clinical Professor of Medicine*
B.A. 1962, Oberlin College; M.D. 1966, Case Western Reserve University

Norman Philip Goldstein, *Professorial Lecturer in Neurology*
B.A. 1941, New York University; M.A. 1942, M.D. 1946, George Washington University

Robert Arnold Goldstein, *Associate Clinical Professor of Medicine (Pulmonary Diseases)*
B.A. 1962, Brandeis University; M.D. 1966, Thomas Jefferson University; Ph.D. 1976, George Washington University

Herbert Otto Goller, *Assistant Research Professor of Orthopaedic Surgery*
B.S. (M.E.) 1958, Stevens Institute of Technology; M.S. 1964, Ph.D. 1968, State University of New York at Buffalo

Herbert Stanley Golomb, *Assistant Clinical Professor of Dermatology*
B.A. 1955, University of Pennsylvania; M.D. 1960, State University of New York Downstate Medical Center

Nelida Gonzalez, *Clinical Instructor in Medicine*
B.A. 1967, City University of New York, Hunter College; M.D. 1971, Georgetown University

Walter Yau Kwai Goo, *Assistant Clinical Professor of Medicine*
B.A. 1960, Harvard University; M.D. 1964, Case Western Reserve University

David John Goodenough, *Associate Professor of Radiology (Radiation Physics)*
B.S. 1967, Ph.D. 1972, University of Chicago

David Henry Goodman, *Assistant Clinical Professor of Medicine*
B.A. 1959, University of Pennsylvania; M.D. 1963, George Washington University

Nelson Gates Goodman, *Clinical Instructor in Medicine*
B.A. 1950, M.D. 1954, Johns Hopkins University

Sam Leon Goodman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1963, City University of New York, Brooklyn College; M.D. 1967, Yeshiva University

Gene Gordon, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1942, Harvard University; M.D. 1946, Boston University

Henri Gordon, *Clinical Instructor in Medicine*
B.A. 1958, Brown University; M.D. 1963, New York University; M.P.H. 1969, Columbia University

Spencer Gordon, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Princeton University; M.D. 1956, Harvard University

Kenneth Paul Gorelick, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, Rutgers—The State University; M.D. 1967, Harvard University

Barry Charles Gorman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1967, Tufts University; M.D. 1971, George Washington University

Patrick Alan Gorman, *Associate Professor of Medicine*
M.B., Ch.B., B.A.O. 1954, Queens University, Ireland; D.C.H. 1956, University of London

Ejnar Gottlieb, *Assistant Clinical Professor of Health Care Sciences*
M.D. 1945, Deutsche-Alpen University, Innsbruck, Austria

Sheldon Kenneth Gottlieb, *Professorial Lecturer in Dermatology*
B.A. 1961, Case Western Reserve University; M.D. 1966, Howard University

Ernest Alva Gould, *Clinical Professor of Surgery*
B.S. 1936, University of Wyoming; M.D. 1939, George Washington University

Herbert Bennett Gould, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.S. 1967, City University of New York, Brooklyn College; M.D. 1971, New York University

Suresh Chandra Goyal, *Assistant Clinical Professor of Child Health and Development*
B.S. 1956, Dr. in Ped. 1967, University of Lucknow, India; M.B., B.S. 1961, King George's Medical College, India

James Henry Graeter, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1970, M.D. 1974, Georgetown University

William Louis Granatir, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1936, University of Pennsylvania; M.D. 1941, Hahnemann Medical College

Bernard Grand, *Associate Clinical Professor of Medicine*
B.A. 1958, Union College, New York; M.D. 1962, New York University

Luther Wilson Gray, Jr., *Assistant Clinical Professor of Surgery*
B.A. 1961, University of Pennsylvania; M.D. 1966, George Washington University

Frederick Chapman Green, *Professor of Child Health and Development and of Health Care Sciences*
B.S. 1942, Indiana University; M.D. 1944, Indiana University at Indianapolis

Linda D. Green, *Assistant Clinical Professor of Medicine*
B.A. 1966, Rice University; M.D. 1970, Duke University

Jay Barry Greenberg, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, M.D. 1975, George Washington University

Larrie Warren Greenberg, *Associate Professor of Child Health and Development*
B.S. 1961, University of Toledo; M.D. 1965, Ohio State University

Richard Alan Greenberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1968, Albright College; M.D. 1973, Thomas Jefferson University

Robert Milton Greenberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1937, M.D. 1941, George Washington University

Albert Aaron Greenfield, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1961, American University; M.D. 1965, Howard University

Robert Thomas Greenfield, *Special Lecturer in Obstetrics and Gynecology*
B.S. 1954, M.D. 1958, Howard University

Charles Stanley Greenhouse, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1959, Alfred University; M.D. 1963, Howard University

Robert Edward Greenspan, *Assistant Clinical Professor of Medicine*
B.S. 1967, M.D. 1971, University of Maryland, Baltimore

Stanley Greenspan, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1962, Harvard University; M.D. 1966, Yale University

Douglas Fielder Greer, *Adjunct Assistant Professor of Ophthalmology*
B.A. 1961, Princeton University; M.D. 1966, Columbia University

Thomas Hamlin Gresinger, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1957, Williams College; M.D. 1961, George Washington University

James Franklin Grim, *Assistant Clinical Professor of Neurology*
B.S. 1964, College of William and Mary; M.S. 1968, George Washington University; M.D. 1
Emory University

Jay Grodin, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1961, Hobart and William Smith Colleges; M.D. 1965, Thomas Jefferson University

Albert Grollman, *Assistant Clinical Professor of Medicine*
B.A. 1952, Lafayette College; M.D. 1956, Thomas Jefferson University

Martha Winter Gross, *Clinical Instructor in Psychiatry and Behavioral Scienc*
B.A. 1968, University of Wisconsin; M.S.W. 1971, University of Chicago

Peter Leonard Gross, *Assistant Professor of Urology*
B.S. 1963, Hobart and William Smith Colleges; M.D. 1968, New York University

Richard Lee Gross, *Associate Clinical Professor of Psychiatry and Behavior Sciences*
B.S. 1956, Muhlenberg College; M.D. 1960, Hahnemann Medical College

John Henry Grossman III, *Associate Professor of Obstetrics and Gynecolo*
B.A. 1967, M.D. 1971, University of Rochester

Kenneth Martin Grundfast, *Assistant Professor of Surgery and of Child Heal and Development*
B.A. 1965, Johns Hopkins University; M.D. 1969, State University of New York

Vincent Livingston Guandolo, *Associate Clinical Professor of Child Health an Development*
B.A. 1953, Kenyon College; M.D. 1962, George Washington University

Arthur P. Guarinello, *Assistant Clinical Professor of Health Care Science and of Child Health and Development*
M.D. 1973, State University of New York Downstate Medical Center

John Gregory Guccion, *Associate Professor of Pathology*
B.A. 1958, John Carroll University; M.D. 1962, Georgetown University

Atin Guha, *Associate Clinical Professor of Medicine*
M.D. 1962, Calcutta National Medical Institute

Diane Antoinette Guida, *Assistant Professor of Health Care Sciences*
B.S.N. 1964, Cornell University; M.S. 1968, University of Rochester

Grace Hughes Guin, *Clinical Professor of Pathology*
B.S. 1938, Birmingham-Southern College; M.D. 1943, Vanderbilt University

Amar Nath Gulati, *Assistant Professor of Radiology*
M.B., B.S. 1958, Prince of Wales Medical College, India; M.S. 1962, Patna University, India

Stephen Flack Gunther, *Associate Professor of Orthopaedic Surgery*
B.A. 1963, Yale University; M.D. 1967, Albany Medical College of Union University

Gordon Guroff, *Professorial Lecturer in Biochemistry*
B.S. 1954, University of Illinois; M.S. 1956, Auburn University; Ph.D. 1959, University
Wisconsin

Milton Gusack, *Clinical Professor of Medicine*
B.A. 1937, M.D. 1941, Johns Hopkins University

Melvyn Robert Haas, *Associate Clinical Professor of Psychiatry and Behavior Sciences*
B.A. 1960, University of Pennsylvania; M.D. 1964, Georgetown University

Stephen Samuel Haas, *Associate Clinical Professor of Orthopaedic Surgery*
M.D. 1965, University of Oklahoma

Paul Adrian Haber, *Assistant Clinical Professor of Medicine*
B.A. 1941, University of Texas at Austin; M.A. 1942, Columbia University; M.D. 1949, University of Texas Medical Branch at Galveston; M.S. in P.A. 1968, George Washington University

John Thomas Hagenbucher, *Assistant Clinical Professor of Medicine; Associate University Physician*
B.S. 1950, Philadelphia College of Pharmacy and Science; M.D. 1957, George Washington University

Riaz Haider, *Associate Clinical Professor of Medicine*
M.B., B.S. 1956, University of Panjab, Pakistan

Evelyn Manning Hall, *Clinical Instructor in Child Health and Development*
B.S. 1967, M.D. 1973, Howard University; M.P.H. 1977, Columbia University

James Lyman Hall, *Assistant Clinical Professor of Pathology*
B.A. 1964, Dartmouth College; M.D. 1968, University of Michigan; Ph.D. 1973, Duke University

William Henry Hall, *Clinical Instructor in Ophthalmology*
B.S. 1971, Howard University; M.D. 1975, State University of New York at Buffalo

Lee Higdon Haller, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1968, M.D. 1972, University of Michigan

Thomas Joseph Halloran, *Special Lecturer in Health Care Sciences*
B.S. 1972, St. Bonaventure University; M.D. 1976, State University of New York Upstate Medical Center

David Philip Hamburger, *Assistant Clinical Professor of Child Health and Development*
A.B. 1968, Brandeis University; M.D. 1972, New York University

Melvin Neal Hamm, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1967, Southwestern Oklahoma State University; M.S. 1972, University of Oklahoma

Mary Kathryn Hammock, *Assistant Professor of Neurological Surgery and of Child Health and Development*
B.S. 1959, University of Miami; M.D. 1967, Northwestern University

Dennis John Hand, *Assistant Clinical Professor of Medicine*
M.D. 1960, University of Edinburgh

Richard Davis Handy, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1967, Harvard University; M.D. 1971, Boston University

Raafat Samy Hannallah, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.Ch. 1966, Cairo University

Ernest Dalton Hanowell, *Assistant Clinical Professor of Surgery*
B.S. 1969, University of California, Davis; M.D. 1973, George Washington University

George White Hardman, Jr., *Associate Clinical Professor of Child Health and Development*
B.A. 1954, M.D. 1958, Johns Hopkins University

Judith Ann Harman, *Assistant Clinical Professor of Health Care Sciences*
B.S.N. 1972, University of Oklahoma

Forest Klaire Harris II, *Assistant Clinical Professor of Medicine*
B.S. 1949, M.D. 1953, George Washington University

Isabella Harrison, *Assistant Clinical Professor of Surgery*
A.B. 1934, Vassar College; M.D. 1938, Johns Hopkins University

William Orville Harrison, *Assistant Clinical Professor of Health Care Scien*
A.B. 1961, Stanford University; M.D. 1966, University of Maryland

David Scott Hartman, *Assistant Clinical Professor of Radiology*
B.A. 1968, University of California, Santa Barbara; M.D. 1972, University of California, Angeles

Thomas Lees Hartman, *Assistant Clinical Professor of Medicine*
B.A. 1936, Muhlenberg College; M.A. 1938, University of Texas; M.D. 1943, Johns Hopki University

Jack Wayne Harvey, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1959, M.D. 1963, George Washington University

William Herbert Harvey, *Assistant Clinical Professor of Medicine*
B.S. 1952, Wagner College; M.D. 1956, Albany Medical College of Union University

Susana Alicia Hassan, *Assistant Clinical Professor of Psychiatry and Behavio al Sciences*
B.A. 1969, Ph.D. 1974, University of California, Berkeley

Thomas Cotton Havell II, *Assistant Clinical Professor of Medicine*
B.A. 1963, Ohio Wesleyan University; M.D. 1967, Georgetown University

Donald Hawkins, *Professor of Human Kinetics and Leisure Studies and Re search Professor of Medicine*
B.A. 1958, King's College, Pennsylvania; M.A. 1960, Lehigh University; Ed.D. 1967, N York University

Harold Pierce Hawley, Jr., *Assistant Professor of Pathology*
B.S. 1967, Cornell University; M.D. 1971, State University of New York Upstate Medic Center

George Joseph Hayes, *Clinical Professor of Neurological Surgery*
B.S. 1940, Catholic University of America; M.D. 1943, Johns Hopkins University

Murdock Head, *Airlie Professor of Medical and Public Affairs; Chairman o the Department of Medical and Public Affairs*
D.D.S. 1947, University of Louisville; M.D. 1953, University of Vermont; LL.B. 1958, Geor Washington University

Bernard Alvin Heckman, *Assistant Clinical Professor of Medicine*
B.S. 1958, George Washington University; M.D. 1962, University of Virginia

Lawrence Hefter, *Assistant Clinical Professor of Pathology*
M.D. 1963, University of Chicago

Achim Jurgen Heintze, *Assistant Clinical Professor of Obstetrics and Gyne cology*
M.D. 1967, University of Hamburg

Naomi Birnbaum Heller, *Assistant Clinical Professor of Psychiatry and Be havioral Sciences*
B.A. 1955, B.S. 1956, University of Chicago; M.D. 1960, Harvard University

Louis M. Hellman, *Professorial Lecturer in Obstetrics and Gynecology*
Ph.B. 1930, Yale University; M.D. 1934, Johns Hopkins University

Elson Bowman Helwig, *Clinical Professor of Pathology (Dermatologic Path ology)*
B.S. 1930, Indiana University; M.D. 1932, Indiana University at Indianapolis

Frederick Barrie Hendricks, *Assistant Clinical Professor of Urology*
B.A. 1958, DePauw University; M.D. 1962, Johns Hopkins University

Myra Hope Herbert, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1955, Rutgers—The State University; M.S.W. 1965, University of Maryland

Maria Mira Herenda, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1955, Bonn University, Germany

Gilbert Richard Herer, *Professor of Child Health and Development*
B.S. 1953, M.S. 1954, Syracuse University; Ph.D. 1964, Northwestern University

Monte Arnold Herman, *Assistant Clinical Professor of Medicine*
B.A. 1956, M.D. 1959, George Washington University

Marc Hertzman, *Associate Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, M.D. 1969, Harvard University

Joseph Herbert Herzberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1965, University of Wisconsin

Helen Hope Hess, *Professor of Neurology and of Biochemistry*
B.A. 1946, B.S. 1948, West Virginia University; M.D. 1951, Harvard University

Jocelyn Muriel Bingley Hicks, *Associate Professor of Child Health and Development and of Pathology*
B.S. 1959, M.S. 1962, University of London; Ph.D. 1971, Georgetown University

George Alfred Higgins, Jr., *Clinical Professor of Surgery*
B.S. 1938, University of New Mexico; M.D. 1942, Harvard University

Fred George Hilkert, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, Syracuse University; M.D. 1955, George Washington University

Robert Fuhr Hinckley, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1955, Bowdoin College; M.D. 1959, Tufts University

Jeanette Dontzow Hines, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1947, Cornell University; M.A. 1957, San Francisco State College; M.A. 1969, New York University

Edward John Hinman, *Associate Clinical Professor of Health Care Sciences*
M.D. 1955, Tulane University; M.P.H. 1971, Johns Hopkins University

Florie Hirsch, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1970, Columbia University; M.D. 1974, George Washington University

Howard Alan Hoffman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, M.D. 1962, Case Western Reserve University

Judith Elaine Hogg, *Assistant Clinical Professor of Neurology*
A.B. 1970, M.D. 1970, Boston University

Peter Holbrook, *Associate Professor of Anesthesiology and of Child Health and Development*
B.A. 1966, Yale University; M.D. 1970, University of Pennsylvania

Sheldon Holen, *Clinical Instructor in Surgery (Periodontics)*
D.D.S. 1955, University of Maryland; M.P.H. 1962, Columbia University

Paul Vincent Holland, *Associate Clinical Professor of Medicine*
B.A. 1958, University of California, Riverside; M.D. 1962, University of California, Los Angeles

Ariel Cahill Hollinshead, *Research Professor of Medicine (Pharmacology); Director, Laboratory for Virus and Cancer Research*
B.A. 1951, Ohio University; M.A. 1955, Ph.D. 1957, George Washington University

Pearl Barbara Holly, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1929, City University of New York, Hunter College; M.S. 1934, M.D. 1938, New York University

Richard Riddick Honablue, Jr., *Assistant Clinical Professor of Health Ca Sciences*
B.S. 1970, Wagner College; M.D. 1974, Meharry Medical College

Nancy Marie Hoover, *Adjunct Instructor in Health Care Sciences*
B.S.N. 1973, Georgetown University

Harold Joseph Hoppman, *Clinical Instructor in Health Care Sciences*
B.S. 1968, Loras College; M.D. 1972, University of Iowa

Richard Steven Horkman, *Lecturer in Pathology*
B.S. 1970, University of South Carolina

Klara Horvath-Pushkas, *Assistant Clinical Professor of Radiology*
M.D. 1968, University of Budapest

Norman Harold Horwitz, *Clinical Professor of Neurological Surgery*
B.A. 1945, Princeton University; M.D. 1948, Columbia University

Stephen Joel Horwitz, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1972, M.D. 1976, George Washington University

Susan Hays Houseman, *Assistant Clinical Professor of Medicine*
B.A. 1966, Oberlin College; M.D. 1970, Wayne State University

William Allen Howard, *Clinical Professor of Child Health and Development*
M.D. 1934, Tulane University

James Robert Howe, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1965, Dartmouth College; M.D. 1969, Tufts University

James Weldon Howell, *Associate Clinical Professor of Pathology (Clinical Chemistry)*
B.S. 1957, Hardin-Simmons University; M.D. 1962, University of Texas, Southwestern Medical School at Dallas

Irene I-Lien Hsu, *Professor of Medicine*
B.S. 1946, St. John's University, China; M.D. 1949, University of Vermont

Kun-huang Huang, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1970, University of Tokyo

Kun-yen Huang, *Professor of Microbiology*
M.D. 1959, National Taiwan University; Ph.D. 1967, George Washington University

Richard Huberman, *Clinical Instructor in Ophthalmology*
B.S. 1959, City University of New York, City College; M.D. 1963, University of Health Sciences/Chicago Medical School

Rudolph Hugh, *Professor of Microbiology*
B.S. 1948, Michigan State University; Ph.D. 1954, Loyola University of Chicago

Violet Bowen Hugh, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1958, M.D. 1961, George Washington University

Wellington Hung, *Professor of Child Health and Development*
B.S. 1953, American University; M.D. 1957, George Washington University

James A. Huntzinger, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. in Ed. 1949, Kutztown State College; M.S. in Ed. 1957, Temple University; M.D. 1961, Howard University

Arthur Proctor Hustead, *Associate Clinical Professor of Neurological Surgery*
B.S. 1949, M.D. 1952, Yale University

Janet Kauderer Hutcheson, *Associate Clinical Professor of Radiology*
B.A. 1955, Barnard College; M.D. 1959, University of Tennessee

William Siti Nagib Ibrahim, *Clinical Instructor in Ophthalmology*
M.B., B.Ch. 1958, Alexandria University, Egypt

James Nels Ihle, *Adjunct Associate Professor of Biochemistry*
B.S. 1968, Iowa State University; M.S. 1969, Ph.D. 1971, University of Georgia

Sands Kenyon Irani, *Assistant Clinical Professor of Medicine*
B.A. 1963, University of the South; M.D. 1968, George Washington University

Nelson Sumner Irey, *Clinical Professor of Pathology*
B.S. 1935, M.D. 1938, University of Pittsburgh

David Irwin, *Assistant Research Professor of Biochemistry*
B.S. 1969, Ph.D. 1974, University of Leeds

Daniel Isaacson, *Clinical Instructor in Otolaryngology*
B.A. 1955, University of New Mexico; M.D. 1964, University of Innsbruck

Norman Harry Isaacson, *Clinical Professor of Surgery*
B.A. 1941, M.D. 1944, New York University

Caryl Mussenden Jackson, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1975, Howard University

Hazel Jackson, *Clinical Instructor in Health Care Sciences*

Michael John Jackson, *Professor of Physiology*
B.S. 1963, University of London; Ph.D. 1966, Sheffield University

Thomas Nedumparambil Jacob, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.B., B.S. 1969, Christian Medical College, India

Eugene Robert Jacobs, *Associate Clinical Professor of Radiology*
B.A. 1951, Syracuse University; M.D. 1955, State University of New York Upstate Medical Center

Robert Philip Jacobs, *Associate Professor of Medicine*
M.D. 1968, New York University

Marshall Hannis Jacobson, *Associate Clinical Professor of Medicine*
B.A. 1945, M.D. 1948, George Washington University

Irwin Sidney Jaffee, *Associate Clinical Professor of Otolaryngology*
B.A. 1952, New York University; M.D. 1956, State University of New York Downstate Medical Center

Frank Skiff Jannotta, *Associate Professor of Pathology*
B.A. 1951, Williams College; M.D. 1955, University of Pennsylvania

William Dabney Jarman, *Clinical Professor of Urology*
B.S. 1927, Hampden-Sydney College; M.D. 1932, University of Virginia

Jeffrey Alan Jay, *Adjunct Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1972, Amherst College; Ph.D. 1977, Duke University

Melvin Jenkins, *Professorial Lecturer in Child Health and Development*
B.A. 1944, M.D. 1946, University of Kansas

Marc Antoine Jerome, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, Lycee Philippe Guerrier; M.D. 1962, Universite d'Etat d'Haiti

Marianne Thieme Jessee, *Assistant Professorial Lecturer in Pathology*
B.S. 1954, Martin Luther University, Germany

Dale Ogden Johnson, *Assistant Professorial Lecturer in Health Care Sciences*
B.S. 1964, M.S., M.B.A. 1967, University of Washington; Ph.D. 1974, Syracuse University

David Charles Johnson, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1969, M.D. 1973, Yale University

Frank Bacchus Johnson, *Associate Clinical Professor of Pathology*
B.S. 1940, University of Michigan; M.D. 1944, Howard University

Jean Kelroy Johnson, *Assistant Professor of Health Care Sciences*
B.A. 1968, University of Illinois; B.S. 1974, Texas Woman's University; M.S. 1978, University of Wisconsin

Joseph Taber Johnson III, *Special Lecturer in Pathology*

Kurt Edward Johnson, *Associate Professor of Anatomy*
B.S. 1965, Johns Hopkins University; M.Phil. 1969, Ph.D. 1970, Yale University

Paul William Johnson, Jr., *Clinical Instructor in Medicine*
B.S. 1972, Yale University; M.D. 1976, Indiana University

Steele Raymond Johnson, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1966, University of Washington; M.D. 1972, George Washington University

Thomas Nick Johnson, *Professor of Anatomy*
B.S. 1944, St. Ambrose College; M.S. 1949, Michigan State University; Ph.D. 1953, University of Michigan

Warren Charles Johnson, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1944, Seattle University; M.D. 1947, St. Louis University

Roger Earl Johnsonbaugh, *Associate Professor of Child Health and Development and of Radiology*
B.A. 1956, Denison University; M.S. 1958, M.D. 1962, University of Cincinnati; Ph.D. 1971, University of North Carolina

Barbara Pendleton Jones, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1968, Wellesley College; M.D. 1974, Ph.D. 1977, Boston University

Charles Wilson Jones, *Associate Clinical Professor of Medicine*
B.A. 1935, Johns Hopkins University; M.D. 1939, University of Maryland

Evan Anthony Jones, *Adjunct Associate Professor of Medicine*
B.S. 1959, M.B., Ch.B. 1962, M.D. 1969, University of Birmingham, England; M.R.C.P. 1965, Royal College of Physicians, England

James Walter Jones, *Lecturer in Pathology*
B.S. 1972, University of Nebraska at Omaha; M.S. 1976, George Washington University

Robert William Jones, *Adjunct Instructor in Radiology*

Marion Harvey Jordan, *Assistant Clinical Professor of Surgery*
B.A. 1965, West Georgia College; M.D. 1969, Medical College of Georgia

David Iglauer Joseph, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Yale University; M.D. 1967, Case Western Reserve University

George Joseph, *Assistant Clinical Professor of Child Health and Development*
B.S. 1957, University of Madras; M.B., B.S. 1962, Kerala University; M.P.H. 1969, Johns Hopkins University

Shelby Harold Josephs, *Assistant Professor of Child Health and Development*
B.A. 1971, University of Pennsylvania; M.D. 1975, Duke University

Yvonne Jung, *Assistant Research Professor of Ophthalmology*
B.S. 1955, Purdue University; M.S. 1958, University of Chicago; Ph.D. 1970, New York University

Joseph Anthony Jurand, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1972, George Washington University; M.D. 1975, Howard University

John Kafka, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1944, Central YMCA Community College; M.S. 1947, University of Chicago; M.D. 1951, Emory University

Hayk Leon Kaftarian, *Clinical Instructor in Child Health and Development*
M.D. 1967, University of Tehran

Kenneth Roman Kahn, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1971, Doane College

Irwin Howard Kaiser, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1945, Brown University; M.D. 1948, New York Medical College

Joel Philip Kalman, *Clinical Instructor in Medicine*
B.A. 1969, Cornell University; M.D. 1973, State University of New York Upstate Medical Center

Herman Leo Kamenetz, *Clinical Professor of Medicine*
B.A. 1943, B.A. 1944, M.S. 1945, M.D. 1952, University of Paris

Robert Joseph Kaminski, *Assistant Clinical Professor of Radiology*
B.S. 1967, University of Michigan; M.D. 1971, Tulane University

Tzu-Min Kao, *Associate Professorial Lecturer in Health Care Sciences*
M.D. 1965, Kachsiung Medical College, Taiwan

Albert Zaven Kapikian, *Research Professor of Child Health and Development*
B.S. 1952, City University of New York, Queens College; M.D. 1956, Cornell University

Kenneth Lawrence Kaplan, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1957, B.S. 1958, M.D. 1962, University of Chicago

Sudesh Puri Kapur, *Assistant Professor of Pathology and of Child Health and Development*
M.B., B.S. 1964, Panjab University, India; M.D. 1970, Postgraduate Institute of Medical Education, India

John Alexander Kark, *Associate Clinical Professor of Medicine*
B.A., M.B. 1966, Oxford University; M.D. 1969, Harvard University

Said A. Karmi, *Associate Professor of Urology*
B.S. 1960, M.D. 1964, American University of Beirut

Maya Tolani Karna, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1961, M.G.M. Medical College, India

Ronald John Karpick, *Assistant Clinical Professor of Medicine*
B.A. 1961, University of Rochester; M.D. 1965, Yale University

Thomas Eugene Kasper, *Clinical Instructor in Urology*
B.A. 1964, Cornell University; M.D. 1969, State University of New York Downstate Medical Center

Mangal Katikineni, *Assistant Clinical Professor of Medicine*
M.D. 1974, Osmania University, India

Karl Radley Katterjohn, *Assistant Professor of Health Care Sciences*
B.A. 1971, Jacksonville University; B.S. 1974, George Washington University

Martin Katz, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1949, City University of New York, Brooklyn College; Ph.D. 1955, University of Texas

Richard Jeffrey Katz, *Assistant Professor of Medicine (Cardiology)*
B.A. 1968, University of Pennsylvania; M.M.S. 1970, Rutgers—The State University; M.D. 1972, New York University

Ronald Alan Katz, *Assistant Clinical Professor of Dermatology*
B.S. 1964, University of Cincinnati; M.D. 1969, University of Maryland

Sol Katz, *Special Lecturer in Medicine (Pulmonary Diseases)*
B.S. 1935, City University of New York, City College; M.D. 1939, Georgetown University

Barry Theodore Katzen, *Associate Clinical Professor of Radiology*
M.D. 1970, University of Miami

Harvey Irwin Katzen, *Assistant Clinical Professor of Medicine*
B.S. 1971, Georgetown University; M.D. 1975, George Washington University

Jacob Joseph Katzow, *Associate Clinical Professor of Psychiatry and Beha-ioral Sciences*
B.A. 1957, M.D. 1960, Stanford University

Meyer Katzper, *Associate Professorial Lecturer in Physiology*
B.A., B.R.E. 1957, Yeshiva University; M.S. 1962, Ph.D. 1967, New York University

Richard Miles Kaufman, *Associate Clinical Professor of Medicine*
B.A. 1955, M.D. 1958, George Washington University

Ronald Paul Kaufman, *Professor of Medicine; Vice President for Medica-Affairs and Executive Dean of the Medical Center*
B.S. 1951, Trinity College, Connecticut; M.D. 1955, University of Pennsylvania

Morton Kavalier, *Clinical Instructor in Medicine*
B.A. 1965, University of Pennsylvania; M.D. 1969, Thomas Jefferson University

Frank James Kavanaugh, *Associate Research Professor of Medical and Public-Affairs*
B.A. 1956, Lake Forest College

Robert Kayton, *Assistant Clinical Professor of Psychiatry and Behavioral Sci-ences*
A.B. 1964, Roosevelt University; M.S. 1967, Ph.D. 1969, University of Massachusetts

Salman Owais Kazmi, *Assistant Clinical Professor of Urology*
B.S. 1961, University of Karachi, Pakistan; M.B., B.S. 1967, University of Dacca, Bangladesh

Thomas Patrick Keenan, *Assistant Clinical Professor of Ophthalmology*
B.S. 1963, Manhattan College; M.D. 1967, Georgetown University

Jack Philip Keeve, *Clinical Professor of Medicine*
A.B. 1948, Hobart and William Smith Colleges; M.D. 1952, New York University; M.P.H. 1958, Yale University

Robert Keimowitz, *Professor of Medicine and of Health Care Sciences; Asso-ciate Dean of the Medical Center, for Student Affairs and Admissions*
B.A. 1961, M.S. 1963, M.D. 1965, University of Vermont

Robert West Keisling, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1971, University of Tennessee

Joanne Keene Kelleher, *Assistant Professor of Physiology*
B.S. 1969, St. Louis University; M.A. 1972, Ph.D. 1976, Boston University

John Francis Kelleher, Jr., *Assistant Professor of Child Health and Develop-ment*
B.S. 1968, Boston College; M.D. 1972, Yale University

George Archibald Kelser, Jr., *Clinical Professor of Medicine*
B.S. 1946, Harvard University; M.D. 1949, George Washington University

Bernard Kemp, *Professorial Lecturer in Clinical Engineering*
B.S. 1949, University of North Carolina; Ph.D. 1957, Vanderbilt University

Martha Rugg Kendall, *Clinical Instructor in Medicine*
B.A. 1969, Wellesley College; M.D. 1976, George Washington University

John Kenealy, *Associate Clinical Professor of Urology*
B.A. 1948, Syracuse University; M.D. 1952, State University of New York Upstate Medical Center

Peter Ignatius Kenmore, *Professor of Orthopaedic Surgery*
M.D. 1947, Hahnemann Medical College

Marie-Louise Levy Kennedy, *Associate Professor of Anesthesiology*
B.S. 1943, College De Ville Franche, De Rouergue, France; M.D. 1952, Strasbourgh Medical School

John Andrew Kenney, Jr., *Professorial Lecturer in Child Health and Development and in Dermatology*
B.S. 1942, Bates College; M.D. 1945, Howard University

Richard Alec Kenney, *Professor of Physiology; Chairman, Department of Physiology*
B.S. 1945, Ph.D. 1947, University of Birmingham

Stephen Gabriel Kent, *Associate Professor of Pathology*
B.A. 1956, M.D. 1960, Case Western Reserve University

James Michael Kerns, *Assistant Professor of Anatomy*
B.A. 1966, St. Olaf College; M.S. 1968, Ph.D. 1972, Purdue University

John Mark Keshishian, *Associate Clinical Professor of Surgery*
M.D. 1950, George Washington University

Samuel Sherwood Kessel, *Clinical Instructor in Child Health and Development*
B.S. (E.E.) 1970, Drexel University; M.D. 1974, Yeshiva University

Israel Kessler, *Associate Clinical Professor of Medicine*
B.A. 1929, M.S. 1930, University of Pennsylvania; M.D. 1934, Temple University

Kenneth Kessler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, M.D. 1969, Temple University

Raymond Bernard Kielich, *Adjunct Associate Professor of Child Health and Development*
D.D.S. 1945, University of Buffalo

Richard F. Kiepfer, *Assistant Professor of Radiology (Nuclear Medicine)*
B.A. 1958, M.A. 1959, Columbia University; M.D. 1963, Seton Hall University

Randall Wayne Killian, *Adjunct Instructor in Radiology*

Chul Kim, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1968, Seoul National University

Hyun Wha Kim, *Associate Professor of Child Health and Development*
M.D. 1942, To-Ho University, Japan

Christina Eve Jensen Kimball, *Associate Clinical Professor of Child Health and Development*
B.A. 1961, Wellesley College; M.D. 1965, University of Virginia

Harvey Lee Kincaid, *Assistant Professor of Child Health and Development*
B.A. 1964, Vanderbilt University; B.A. 1965, Texas Christian University; M.S. 1968, Baylor University; Ph.D. 1971, University of Texas

Phyllis Dawn Kind, *Professor of Microbiology and of Medicine*
B.A. 1955, Montana State University; M.S. 1956, Ph.D. 1960, University of Michigan

Joseph King, *Associate Clinical Professor of Medicine*
B.A. 1941, Princeton University; M.D. 1944, Johns Hopkins University

Lawrence Marion King, Jr., *Associate Clinical Professor of Ophthalmology*
B.S. 1948, Louisiana Tech University; M.D. 1953, Louisiana State University in New Orleans

Robert A. King, *Assistant Professor of Psychiatry and Behavioral Scienc and of Child Health and Development*
B.A. 1963, Cornell University; B.A. 1965, Oxford University; M.D. 1968, Harvard University

Adrian John Kinnane, *Assistant Clinical Professor of Child Health and D velopment*
B.A. 1970, Boston College; Ph.D. 1976, Catholic University of America

Nigar Kirmani, *Assistant Clinical Professor of Medicine*
M.B., B.S. 1973, King Edward Medical College, Pakistan

Stanley Martin Kirson, *Associate Clinical Professor of Surgery*
B.A., M.D. 1957, George Washington University

Stanley William Kirstein, *Associate Clinical Professor of Medicine*
B.A. 1939, M.D. 1943, George Washington University

Hans Joachim Klapproth, *Assistant Clinical Professor of Urology*
M.D. 1951, University of Hamburg

Hanna Klaus, *Associate Clinical Professor of Obstetrics and Gynecology*
A.B. 1948, M.D. 1950, University of Louisville

Jack Kleh, *Associate Clinical Professor of Medicine*
B.A. 1942, M.D. 1944, George Washington University

Morris Kleinerman, *Clinical Professor of Psychiatry and Behavioral Science*
B.S. 1929, City University of New York, City College; M.D. 1933, University of St. Andrews Scotland

Bradford Allan Kleinman, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1972, M.D. 1976, University of Maryland

Walter Gerald Klingler, *Assistant Clinical Professor of Dermatology*
B.A. 1966, Ohio Wesleyan University; M.D. 1970, University of Michigan

Raymond William Klofkorn, *Assistant Clinical Professor of Health Care Sci ences*
B.S. 1960, University of Wyoming; M.D. 1964, University of Colorado

Philip Klubes, *Professor of Pharmacology*
B.S. 1956, City University of New York, Queens College; M.S. 1959, Ph.D. 1962, University of Minnesota

Panpit Pansuwana Klug, *Associate Professor of Medicine*
M.D. 1955, University of Medical Sciences, Thailand

Anne Lowe Knasel, *Special Lecturer in Child Health and Development*
B.A. 1963, Lake Erie College; M.D. 1968, Boston University

William Knaus, *Assistant Professor of Anesthesiology and Assistant Research Professor of Clinical Engineering*
B.S. 1968, Widener College; M.D. 1972, West Virginia University

Stanley Marc Knoll, *Assistant Clinical Professor of Surgery*
B.S. 1964, University of Pittsburgh; M.D. 1968, University of Health Sciences/Chicago Medical School

Arthur Irwin Kobrine, *Professor of Neurological Surgery*
B.A. 1964, M.D. 1968, Northwestern University; Ph.D. 1979, George Washington University

Barbara Koch, *Assistant Professor of Child Health and Development*
B.A. 1968, Clark University; M.D. 1972, Boston University

Edward Graeme Koch, *Assistant Clinical Professor of Obstetrics and Gyne cology*
B.A. 1964, M.A. 1965, University of California, Los Angeles; M.D. 1969, George Washington University

Marilyn Jean Koering, *Professor of Anatomy*
B.A. 1960, College of St. Scholastica; M.S. 1963, Ph.D. 1967, University of Wisconsin

Israel Kogan, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1965, New York University; M.D. 1969, State University of New York at Buffalo

Leonard Kogan, *Clinical Instructor in Ophthalmology*
M.D. 1957, University of Maryland

Florence L. Kolodner, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1964, Barnard College; M.S.W. 1976, Catholic University of America

George Frederick Kolodner, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Williams College; M.D. 1967, University of Rochester

Edward Ronald Kolvereid, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, Ohio University; M.D. 1960, Ohio State University

George Matthew Korengold, *Clinical Instructor in Child Health and Development*
B.A. 1968, University of Pennsylvania; M.D. 1972, George Washington University

Marvin Curtis Korengold, *Assistant Clinical Professor of Neurology*
D.D.S. 1945, B.S. 1947, M.B. 1949, M.D. 1950, University of Minnesota

Paul Lee Kornblith, *Professorial Lecturer in Neurological Surgery*
B.A. 1958, Temple University; M.D. 1962, Thomas Jefferson University

Andre Kornhauser, *Adjunct Associate Professor of Dermatology*
B.S., M.S. 1955, Ph.D. 1962, University of Zagreb

Jack Martin Korsower, *Clinical Professor of Radiology*
B.S. 1962, City University of New York; M.D. 1966, Yeshiva University

Bernardo Kotelanski, *Assistant Clinical Professor of Medicine*
M.D. 1964, University of Buenos Aires

Eduard V. Kotlyarov, *Associate Clinical Professor of Radiology*
M.D. 1965, Ph.D. 1968, D.M.S. 1971, First Moscow Medical Institute

Herbert Louis Kotz, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1953, M.D. 1956, George Washington University

Spiridon Koulouris, *Assistant Professor of Neurological Surgery*
M.D. 1960, University of Salonika, Greece

Paul Jerome Kovalcik, *Special Lecturer in Health Care Sciences*
B.A. 1964, City University of New York, Queens College; M.D. 1969, Georgetown University

Michael Kenneth Kowalski, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1967, King's College, Pennsylvania; M.D. 1971, Temple University

Louis Kozloff, *Assistant Clinical Professor of Surgery*
B.A. 1965, M.D. 1969, University of Pennsylvania

Barton Kraff, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1961, University of Rochester; M.D. 1965, State University of New York at Buffalo

David Kram, *Adjunct Assistant Professor of Radiology*
B.A. 1971, Ph.D. 1976, University of Connecticut

Celia Anne Kramer, *Assistant Professor of Medicine*
B.S. 1970, M.D. 1974, University of Maryland

Norman Clifford Kramer, *Professor of Medicine*
B.S. 1948, The Citadel; M.S. 1950, M.D. 1954, George Washington University

Peter David Kramer, *Adjunct Instructor in Psychiatry and Behavioral Sciences*
A.B. 1970, M.D. 1976, Harvard University

Robert Kramer, *Clinical Instructor in Medicine*
B.A. 1949, Indiana University; M.D. 1956, University of Geneva

August Kramm, *Assistant Professorial Lecturer in Obstetrics and Gynecol*
B.A. 1936, M.D. 1940, Georgetown University

Ruediger Kratz, *Assistant Clinical Professor of Neurology*
M.D. 1973, University of Chicago

Bruce Robert Kressel, *Adjunct Assistant Professor of Medicine*
A.B. 1969, Lafayette College; M.D. 1973, Tufts University

Leo Edward Kreuz, *Assistant Clinical Professor of Psychiatry and Behavio*
Sciences
B.A. 1960, Harvard University; M.D. 1964, Johns Hopkins University

Malvin Donald Krinn, *Assistant Clinical Professor of Ophthalmology*
M.D. 1965, University of Illinois

Morris Edward Krucoff, *Associate Clinical Professor of Otolaryngology*
B.S. 1937, M.D. 1942, George Washington University

Dean Krueger, *Research Professor of Statistics and of Ophthalmology*
B.A. 1938, M.A. 1942, University of Chicago; M.S. 1959, Columbia University

John James Kuhn, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1934, M.D. 1938, Georgetown University

Thomas Bayard Kulb, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1974, M.D. 1977, Indiana University

Ajit Kumar, *Associate Professor of Biochemistry*
Ph.D. 1968, University of Chicago

Walter Kurland, *Assistant Professor of Medicine*
B.S. 1942, M.D. 1945, George Washington University

Ronald Dale Kurstin, *Assistant Clinical Professor of Surgery*
B.A. 1967, Tulane University; M.D. 1971, George Washington University

William Kurstin, *Assistant Clinical Professor of Medicine*
B.S. 1941, M.D. 1943, George Washington University

Ronald Kurz, *Professor of Psychiatry and Behavioral Sciences and of Chil*
Health and Development
B.A. 1955, New York University; Ph.D. 1960, Indiana University

Stephen Jay Kurzbard, *Assistant Clinical Professor of Radiology*
B.A. 1958, New York University; M.D. 1962, Yeshiva University

David Howard Kushner, *Professorial Lecturer in Obstetrics and Gynecology*
B.S. 1926, M.D. 1928, Georgetown University

Edward Irving Kushner, *Clinical Professor of Psychiatry and Behavioral Sci*
ences
B.S. in Med. 1947, University of Nebraska; M.D. 1949, New York Medical College

Jack Kushner, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1960, Tulane University; M.D. 1964, University of Alabama in Birmingham

Truvor Vadym Kuzmowych, *Assistant Professor of Medicine*
B.A. 1965, La Salle College; M.D. 1969, Thomas Jefferson University

Arnold Martin Kwart, *Associate Clinical Professor of Urology*
B.S. 1964, University of Florida; M.D. 1968, Duke University

William Thurston Lady, *Associate Clinical Professor of Obstetrics and Gyne*
cology
M.D. 1938, George Washington University

Alfred Shing-Tai Lai, *Clinical Instructor in Medicine*
M.D. 1970, National Taiwan University

Barry J. Landau, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1963, Columbia University; M.D. 1966, New York University

Jeffrey Harris Lane, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, University of Rochester; M.D. 1975, Albany Medical College of Union University

Paul Allan Lange, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, M.D. 1967, University of Chicago

David Arthur Lanham, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1951, M.D. 1955, St. Louis University

David Lloyd Lanter, *Clinical Instructor in Ophthalmology*
B.S. 1959, City University of New York, Queens College; M.D. 1963, New York Medical College

Anita Iff Lao, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1963, George Washington University

Francis Gerald LaPiana, *Associate Clinical Professor of Ophthalmology*
M.D. 1962, George Washington University

John LaRosa, *Professor of Medicine and of Health Care Sciences*
B.S. 1961, M.D. 1965, University of Pittsburgh

John Walter Larsen, Jr., *Associate Professor of Obstetrics and Gynecology*
B.A. 1964, Dartmouth College; M.D. 1968, Cornell University

Joseph Bruce Laskowski, *Special Lecturer in Health Care Sciences*

Peter Charles Latkin, *Assistant Clinical Professor of Medicine and of Child Health and Development*
B.S. 1964, College of William and Mary; M.D. 1968, New York Medical College

Henry Prather Laughlin, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1937, Ursinus College; M.D. 1941, Temple University

Robert Laureno, *Assistant Clinical Professor of Neurology*
B.A. 1967, M.D. 1971, Cornell University

Robert Alan Lavine, *Associate Professor of Physiology and of Neurology*
B.S. 1962, Ph.D. 1969, University of Chicago

Stanford A. Lavine, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1950, M.D. 1954, University of Maryland

Betsy Ellen Smith Lawrence, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1968, M.S. 1971, Ph.D. 1974, University of Oklahoma

Walter Edward Lawrinson, *Associate Clinical Professor of Neurological Surgery*
B.S. 1960, M.D. 1964, Case Western Reserve University

Allan Michael Lazarus, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1965, City University of New York, Brooklyn College; M.D. 1969, New York University

Arnold Albert Lear, *Associate Clinical Professor of Medicine*
M.D. 1950, Harvard University

Paul David Leber, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1958, Hamilton College; M.D. 1963, New York University

J. Martin Lebowitz, *Assistant Clinical Professor of Neurology*
B.A. 1960, M.D. 1963, Northwestern University

Ernest Etienne Leclerc, *Special Lecturer in Health Care Sciences*

Martin Edward Lederman, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.A. 1960, City University of New York, Brooklyn College; M.D. 1964, Yeshiva University

Don Seung Lee, *Assistant Professor of Anesthesiology*
M.D. 1966, Catholic Medical College, Korea

Sang Nam Lee, *Associate Clinical Professor of Radiology (Therapy)*
M.D. 1965, Catholic Medical College, Korea

Son Taek Lee, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1962, Seoul National University

Leonard Lefkowitz, *Associate Clinical Professor of Child Health and Development*
B.A. 1957, Alfred University; M.D. 1962, University of Health Sciences/Chicago Medical School

Glenn Duane Legler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1954, St. Olaf College; M.D. 1958, University of Wisconsin

Gregory Alfred Lehmer, *Special Lecturer in Pathology*

Harold Bernard Lehrman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1939, Bowdoin College; M.D. 1943, Tufts University

Susan Leibenhaut, *Clinical Instructor in Medicine*
B.S. 1972, Massachusetts Institute of Technology; M.D. 1975, Yeshiva University

Sanford Leon Leikin, *Professor of Child Health and Development*
M.D. 1947, University of Louisville

Fred Leonard, *Research Professor of Medicine (Rehabilitation Medicine) and of Orthopaedic Surgery; Associate Dean of the Medical Center, for Research*
B.S. 1938, University of Arkansas; M.S. 1942, Ph.D. 1947, Polytechnic Institute of Brooklyn

Edwin Milton Lerner II, *Research Professor of Microbiology*
B.A. 1941, M.D. 1944, Harvard University

Lawrence Stephen Lessin, *Professor of Medicine and of Pathology; Director of the Division of Hematology and Oncology*
M.D. 1962, University of Chicago

Gordon Sparks Letterman, *Professor of Surgery (Plastic Surgery)*
B.A. 1937, B.S. in Med.Sc. 1940, M.D. 1941, Washington University

Arthur Jerome Levens, *Associate Clinical Professor of Neurology*
B.S. 1940, M.D. 1944, University of Wisconsin

Stanley M. Levenson, *Assistant Research Professor of Radiology*
B.S. 1964, University of Wisconsin; M.D. 1968, University of Maryland

L. David Levi, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1960, Harvard University; M.D. 1964, Cornell University

Shelley Palay Levi, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.A. 1961, Radcliffe College; M.A. 1961, Columbia University

Barry Jay Levin, *Assistant Clinical Professor of Surgery*
B.A. 1966, M.D. 1970, Emory University

Jack Louis Levine, *Associate Clinical Professor of Otolaryngology and of Child Health and Development*
M.D. 1938, George Washington University

Paul H. Levine, *Assistant Clinical Professor of Medicine*
B.A. 1959, Cornell University; M.D. 1963, University of Rochester

Richard F. Levine, *Assistant Professor of Medicine*
B.A. 1962, M.D. 1966, Johns Hopkins University

Robert Howard Levitt, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1968, M.D. 1972, State University of New York at Buffalo

Arnold Glenn Levy, *Associate Clinical Professor of Medicine*
B.A. 1968, M.D. 1971, George Washington University

Charles Steven Levy, *Assistant Professor of Medicine*
B.A. 1969, Washington University; M.D. 1973, Cornell University

Ann Maria Lewicki, *Professor of Radiology*
B.A. 1956, Albion College; M.D. 1959, Wayne State University

James Hendricks Lewis, *Assistant Professor of Medicine*
B.A. 1971, Oberlin College; M.D. 1975, State University of New York Downstate Medical Center

Randall Jeffrey Lewis, *Associate Professor of Orthopaedic Surgery*
B.A. 1965, Yale University; M.D. 1969, Harvard University

Tommy Earl Lewis, *Adjunct Instructor in Radiology (Nuclear Medicine Technology)*

Robert Todd Lewit, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, M.D. 1963, Harvard University

Choh Luh Li, *Clinical Professor of Neurological Surgery*
M.D. 1942, National Medical College of Shanghai; M.S. 1950, Ph.D. 1954, McGill University

Joel E. Lichtenstein, *Professorial Lecturer in Radiology*
B.E.E. 1964, Cornell University; M.S. 1966, M.D. 1972, Ohio State University

Manfred Wilhelm Lichtmann, *Associate Professor of Anesthesiology*
B.S. 1954, Wagner College; M.D. 1963, Thomas Jefferson University

Edwin James Lieberman, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1955, University of California, Berkeley; M.D. 1958, University of California, San Francisco; M.P.H. 1963, Harvard University

Norman Allen Lieberman, *Clinical Instructor in Medicine*
B.A. 1959, New York University; M.D. 1963, New York Medical College

William Edward Lightfoote II, *Assistant Clinical Professor of Neurology*
B.A. 1963, Grinnell College; M.D. 1967, Howard University

Jane Ellin Lincoln, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1952, Rutgers—The State University; M.S.W. 1969, Catholic University of America

Joseph Lindsay, Jr., *Professor of Medicine*
B.S. 1954, Clemson University; M.D. 1958, Emory University

Craig William Linebaugh, *Associate Professor of Speech and Associate Research Professor of Medicine*
B.A. 1970, Lebanon Valley College; M.A. 1974, Ph.D. 1975, Temple University

Adrian Smith Lineberger, *Associate Clinical Professor of Pathology*
B.S. 1952, M.D. 1955, University of North Carolina

Ching Clifton Ling, *Associate Professor of Radiology*
B.S. 1965, Oregon State University; M.S. 1967, Ph.D. 1971, University of Washington

Ralph Burgess Lingeman, *Associate Professor of Pathology*
M.D. 1953, Indiana University

Lewis Edward Lipkin, *Adjunct Professor of Clinical Engineering*
B.A. 1945, M.D. 1949, New York University

Daniel Gordon Lipman, *Assistant Clinical Professor of Psychiatry and havioral Sciences*
M.D. 1940, Middlesex Hospital Medical School, England

Edward Robert Lipsit, *Assistant Professor of Radiology*
B.A. 1971, Yeshiva University; M.D. 1975, Georgetown University

Steven Howard Lipsius, *Associate Clinical Professor of Psychiatry and havioral Sciences and of Obstetrics and Gynecology*
B.S. 1962, St. Joseph's College, Pennsylvania; M.D. 1963, M.A. 1965, Temple University

Ace Lipson, *Assistant Professor of Medicine*
B.A. 1969, New York University; M.D. 1973, Washington University

George Liss, *Clinical Instructor in Ophthalmology*
B.A. 1955, M.D. 1958, George Washington University; M.S. 1964, Marquette University

Leon McNeely Liverett, *Associate Clinical Professor of Obstetrics and Gyn cology*
B.S. 1943, Butler University; M.D. 1945, Indiana University at Indianapolis

Amy Bookman Livingood, *Assistant Professor of Psychiatry and Behavioral Sc ences and of Child Health and Development*
B.A. 1971, State University of New York at Stony Brook; M.A. 1973, Ph.D. 1977, University Maryland

Raymond Edward Lockard, *Assistant Research Professor of Biochemistry*
B.S. 1966, Syracuse University; Ph.D. 1972, University of Cincinnati

Charles Willard Locke, Jr., *Assistant Professorial Lecturer in Pathology*
B.S. 1974, University of Detroit; M.S. 1978, Wayne State University

John Hayes Lodge, *Assistant Clinical Professor of Ophthalmology*
B.A. 1947, West Virginia University; M.D. 1951, Johns Hopkins University

Robert Loeffler, *Clinical Instructor in Orthopaedic Surgery*
B.S. 1963, Columbia University; M.D. 1967, Yeshiva University

Glydon Allen Logsdon, *Clinical Instructor in Health Care Sciences*

David L. Loiselle, *Research Instructor in Psychiatry and Behavioral Science and in Child Health and Development*
B.A. 1970, Northeastern University; Ph.D. 1978, State University of New York at Stony Brook

James Walling Long, *Assistant Clinical Professor of Medicine*
M.D. 1943, George Washington University

John A. Long, Jr., *Associate Professorial Lecturer in Radiology*
B.S. 1969, University of Notre Dame; M.D. 1973, Georgetown University

Emigdio A. Lopez, Jr., *Assistant Clinical Professor of Clinical Engineering and of Medicine*
B.S. 1968, Manila University; M.D. 1972, University of the Philippines

Ruth Butler Lott, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1957, M.S.W. 1960, University of North Carolina

Samuel Dennis Loube, *Clinical Professor of Medicine*
B.A. 1941, M.D. 1943, George Washington University

Chow-Eng Low, *Assistant Research Professor of Biochemistry*
B.S. 1962, Chung Chi College, Hong Kong; M.S. 1966, Texas Southern University; Ph.D. 1970, University of Texas

Teresa Ling-Chun Kao Low, *Assistant Research Professor of Biochemistry*
B.S. 1962, Tunghai University, Taiwan; M.S. 1966, Texas Woman's University; Ph.D. 1970, University of Texas

John Andrew Lowe, *Assistant Clinical Professor of Child Health and Development*
B.A. 1964, Harvard University; M.D. 1968, Tufts University

Beal Aptheker Lowen, *Clinical Instructor in Medicine*
B.A. 1966, Columbia University; M.D. 1970, Medical College of Virginia of Virginia Commonwealth University

Naomi Corman Luban, *Assistant Professor of Child Health and Development*
B.A. 1968, Connecticut College; M.D. 1972, City University of New York, Mount Sinai School of Medicine

Norman Alan Luban, *Assistant Clinical Professor of Neurology*
B.A. 1967, State University of New York at Buffalo; M.D. 1971, Yeshiva University

Jean Pitner Lucas, *Assistant Clinical Professor of Health Care Sciences and of Medicine*
B.A. 1944, B.S. 1946, University of Mississippi; M.D. 1948, George Washington University

William Matthew Lukash, *Professor of Medicine*
B.S. 1952, Michigan State University; M.D. 1956, University of Michigan

James Lindsay Luke, *Clinical Professor of Pathology (Forensic)*
B.S. 1956, Columbia University; M.D. 1960, Case Western Reserve University

Robert John Lull, *Associate Clinical Professor of Radiology*
B.A. 1962, Canisius College; M.D. 1966, Albany Medical College of Union University

Penn Lupovich, *Assistant Clinical Professor of Pathology*
B.A. 1959, Johns Hopkins University; M.D. 1964, University of Health Sciences/Chicago Medical School

Thomas Joseph Lustberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1965, University of Cincinnati; M.D. 1970, Vanderbilt University

Warren Edward Lux, Jr., *Assistant Clinical Professor of Neurology*
B.A. 1965, Amherst College; M.D. 1970, New York University

John William Lyles, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.M.E. 1954, Cornell University; M.D. 1970, George Washington University

Dorcas Joanne Lynn, *Assistant Professor of Health Care Sciences and of Medicine; Faculty Associate for Humanities and Medicine, Division of Experimental Programs*
B.S. 1970, Dickinson College; M.D. 1974, Boston University

Carl Charles MacCartee, Jr., *Clinical Instructor in Orthopaedic Surgery*
B.A. 1963, Duke University; M.D. 1967, Georgetown University

John Stephen MacDonald, *Adjunct Associate Professor of Medicine*
A.B. 1965, B.M.S. 1967, Dartmouth College; M.D. 1969, Harvard University

Mhairi Graham MacDonald-Ginzburg, *Assistant Professor of Child Health and Development*
B.S. 1969, M.B., Ch.B. 1969, University of Edinburgh

Steven D. Macht, *Assistant Professor of Surgery (Plastic Surgery)*
B.S. 1966, D.D.S. 1969, University of Maryland; M.D. 1972, George Washington University

Thayer Mills Mackenzie, *Associate Clinical Professor of Psychiatry and havioral Sciences*
B.S. 1944, Harvard University; M.D. 1947, Johns Hopkins University

Beryce W. MacLennan, *Clinical Professor of Psychiatry and Behavioral ences*
B.S. 1947, London School of Economics; Ph.D. 1960, London University

James Don MacLowry, *Adjunct Associate Professor of Microbiology*
B.A. 1956, Yale University; M.D. 1960, Columbia University

John E. Madewell, *Professorial Lecturer in Radiology*
M.D. 1969, University of Oklahoma

Ivan Vasil Magal, *Clinical Instructor in Medicine*
Th.B. 1944, Baptist Theological Seminary, Hungary; B.A. 1948, Eastern Mennonite Col B.S. 1949, Lebanon Valley College; M.D. 1954, Medical College of Virginia of Virginia C monwealth University

Csaba Ladislo Magassy, *Assistant Clinical Professor of Surgery (Plastic Surg*
B.S. 1958, M.D. 1962, Creighton University

Daniel Bruce Magilavy, *Assistant Professor of Child Health and Developm*
A.B. 1968, Washington University; M.D. 1972, Ohio State University

Iradj Mahdavi, *Associate Clinical Professor of Child Health and Developm*
M.D. 1956, University of Tehran

John Gail Maier, *Clinical Professor of Radiology*
M.D. 1952, St. Louis University; M.S. 1959, University of Colorado; Ph.D. 1963, Univers of Rochester

Massoud Majd, *Professor of Radiology and of Child Health and Developm*
M.D. 1960, University of Tehran

Martin Miles Malawer, *Assistant Professor of Orthopaedic Surgery and Child Health and Development*
A.B. 1955, State University of New York at Buffalo; M.D. 1969, New York University

Jocelyn Ruth Schoen Malkin, *Associate Clinical Professor of Psychiatry an Behavioral Sciences and of Child Health and Development*
B.A. 1947, Columbia University; M.D. 1952, Yale University

Kalisankar Mallik, *Associate Research Professor of Medicine*
B.S. 1959, B.Tech. 1961, M.Tech. 1962, Calcutta University; M.S. 1969, George Washingto University

John R. Maloney, *Assistant Clinical Professor of Psychiatry and Behavior Sciences*
B.A. 1965, Wake Forest University; M.D. 1972, Temple University

Bayani Lipana Manalo, *Assistant Clinical Professor of Medicine*
B.A. 1962, M.D. 1967, University of the Philippines

Harold George Mandel, *Professor of Pharmacology; Chairman of the Depart ment of Pharmacology*
B.S. 1944, Ph.D. 1949, Yale University

Harry Armstrong Mangold, *Assistant Clinical Professor of Child Health an Development*
B.A. 1950, College of Wooster; B.D. 1953, McCormick Theological Seminary; M.D. 1964, University of Cincinnati

Hildegard Wessel Manitsas, *Assistant Clinical Professor of Anesthesiology*
M.D. 1951, Free University of Berlin

James Packard Mann, *Associate Clinical Professor of Medicine*
M.D. 1947, George Washington University

Emanuele Mannarino, *Associate Clinical Professor of Neurological Surgery*
M.D. 1951, University of Rome; M.D. 1963, Duke University

George Mara, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1977, George Washington University

Paul Jerome Marangos, *Professorial Lecturer in Biochemistry*
B.A. 1969, Rhode Island College; Ph.D. 1973, University of Rhode Island

Allen Elias Marans, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1949, Georgetown University

Devra C. Marcus, *Assistant Clinical Professor of Medicine*
B.A. 1961, Brandeis University; M.D. 1966, Stanford University

Dan Alden Marden, *Adjunct Assistant Professor of Radiology*
B.A. 1977, George Washington University

Andrew Menges Margileth, *Adjunct Professor of Child Health and Development*
B.A. 1942, Washington and Jefferson College; B.S. 1944, Massachusetts Institute of Technology; M.D. 1947, University of Cincinnati

Carl Ira Margolis, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Columbia University; M.D. 1963, University of Basel, Switzerland

Richard Sheldon Margolis, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1965, Pennsylvania State University; M.D. 1969, George Washington University

David Mervyn Margulies, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, Columbia University; M.D. 1961, Northwestern University

Irwin Henley Marill, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1950, Brown University; M.D. 1954, Hahnemann Medical College

Stanley Marinoff, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1958, University of Pennsylvania; M.D. 1962, University of Health Sciences/Chicago Medical School; M.P.H. 1970, Harvard University.

Bruce Michael Markle, *Assistant Professor of Radiology and of Child Health and Development*
A.B. 1970, Brown University; M.D. 1974, Yale University

John Lloyd Marlow, *Assistant Professor of Obstetrics and Gynecology*
B.S. 1957, Brigham Young University; M.D. 1961, George Washington University

Barry Joel Maron, *Assistant Research Professor of Child Health and Development*
B.A. 1963, Occidental College; M.D. 1968, Tulane University

John Daughtry Marriott, *Associate Clinical Professor of Radiology*
B.A. 1958, M.D. 1962, University of North Carolina

William Laverne Marsh, *Professor of Pathology and of Anesthesiology*
B.S. 1942, Purdue University; M.D. 1946, State University of New York at Buffalo

Leon Alponse Martel, *Assistant Clinical Professor of Obstetrics and Gynecology*
M.D. 1947, Georgetown University

Dean Harrington Martin, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1950, George Washington University

Diana Martin, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1971, Radcliffe College; M.D. 1975, Boston University

Mary Jean Matthews, *Professor of Pathology*
B.A. 1946, M.D. 1949, George Washington University

Daniel Davis Maxwell, *Associate Clinical Professor of Radiology*
B.A. 1963, M.D. 1968, Emory University

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1946, Medical College of Virginia of Virginia Commonwealth University; M.S. Trinity University; Ph.D. 1960, Vanderbilt University

Hugh Alexander McAllister, *Professorial Lecturer in Medicine*
B.S. 1961, Davidson College; M.D. 1966, University of North Carolina

George Morris McCullars, *Assistant Clinical Professor of Pathology (Laboratory Medicine) and of Neurology*
B.S. 1967, University of Florida; M.S. 1971, M.Phil. 1974, M.D. 1975, Ph.D. 1976, George Washington University

William Stran McCurley, *Associate Clinical Professor of Child Health and Development*
B.S. 1959, Villanova University; M.D. 1963, Hahnemann Medical College

Charles Walter McCutchen, *Assistant Clinical Professor of Orthopaedic Surgery (Biomechanics)*
B.A. 1950, Princeton University; M.S. 1952, Brown University; Ph.D. 1957, Cambridge University

John Leroy McDonald, *Special Lecturer in Health Care Sciences*
B.S. 1963, M.S. 1964, Cornell University; Ph.D. 1974, University of Arizona

Robert LeRoy McDowell, Jr., *Assistant Clinical Professor of Child Health and Development*
B.A. 1970, M.D. 1974, Harvard University

James Jerry McFarland, Jr., *Clinical Professor of Otolaryngology and of Child Health and Development; Chairman, Department of Otolaryngology*
B.S. 1935, Cumberland College of Tennessee; M.D. 1938, University of Tennessee

Dale Elroy McFarlin, *Adjunct Professor of Neurology*
B.A. 1957, M.D. 1961, Vanderbilt University

Willis Alexander McGill II, *Associate Professor of Anesthesiology and of Child Health and Development*
B.S. 1963, Westminster College; M.D. 1967, University of Pittsburgh

Larry McGowan, *Professor of Obstetrics and Gynecology*
B.S. 1950, Millikin University; B.S. in Med. 1952, M.D. 1954, University of Illinois

Brady Piersol McKaig, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1957, University of Notre Dame; M.D. 1961, Cornell University

Douglas William McKay, *Professor of Orthopaedic Surgery and of Child Health and Development*
B.A. 1951, University of Maine at Orono; M.D. 1955, Tufts University

William Prentiss McKelway, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1943, Washington and Lee University; M.D. 1950, George Washington University

Donald Harrison McKnew, Jr., *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1955, Yale University; M.D. 1961, Johns Hopkins University

John Johnson McMillan, *Associate Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1943, Wake Forest University; M.A. 1948, Ph.D. 1951, Duke University

William James McSweeney, *Professor of Radiology and of Child Health and Development*
B.S. 1957, College of the Holy Cross; M.D. 1961, University of Vermont

Susan Violet Meade, *Lecturer in Pathology*
B.S. 1972, University of Michigan

Henry Michael Meagher, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1967, Georgetown University

Ann Elizabeth Medinger, *Assistant Professor of Medicine*
B.A. 1967, Carleton College; M.D. 1971, University of Pennsylvania

John Edmond Meeks, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1954, Hendrix College; M.D. 1957, University of Tennessee

Elizabeth S. Meid, *Assistant Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
A.B. 1967, Oberlin College; Ph.D. 1971, Yale University

Gordon Weed Mella, *Associate Clinical Professor of Child Health and Development*
B.S. 1953, Ursinus College; M.D. 1956, Thomas Jefferson University

Robert Seamen Melville, *Clinical Professor of Pathology (Laboratory Medicine)*
B.A. 1932, Clark University; Ph.D. 1950, University of Iowa

Sander Holstein Mendelson, *Assistant Professor of Medicine*
B.A. 1956, Wesleyan University; M.D. 1960, New York University

Wallace Brand Mendelson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, University of Texas; M.D. 1969, Washington University

Nicholas Mendjuk, *Clinical Instructor in Medicine*
M.D. 1964, University of Madrid

Jean Hugues Menetrez, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1942, University of Besançon, France; M.D. 1950, McGill University

Gertrud Weber Mergner, *Assistant Professor of Anesthesiology*
M.D. 1967, University of Iowa

John Frederick Mermel, *Associate Clinical Professor of Medicine*
B.S. 1956, Georgetown University; M.D. 1960, George Washington University

Carl Ronald Merril, *Professorial Lecturer in Biochemistry*
B.S. 1958, College of William and Mary; M.D. 1962, Georgetown University

Jerry Francis Meyer, *Associate Clinical Professor of Medicine*
M.D. 1963, University of Chicago

Barbara Ann Meyer Meyers, *Assistant Clinical Professor of Medicine*
B.A. 1961, Bryn Mawr College; M.D. 1968, George Washington University

Frederick Meyers, *Assistant Clinical Professor of Medicine*
B.S. 1955, Purdue University; M.D. 1959, University of Cincinnati

Herman Arnold Meyersburg, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1933, M.D. 1938, New York University

Morris Irwin Michael, *Special Lecturer in Child Health and Development*
B.A. 1938, Cornell University; M.D. 1942, George Washington University

Elizabeth Aldrich Michielli, *Lecturer in Pathology*
B.S. 1973, Michigan State University

Hubert Sheldon Mickel, *Clinical Instructor in Neurology*
B.S. 1958, Eastern Nazarene College; M.D. 1962, Harvard University

Frank Murray Midgley, *Associate Professor of Surgery and of Child Heal and Development*
B.A. 1961, Princeton University; M.D. 1965, Albany Medical College of Union University

Richard John Mier, *Assistant Clinical Professor of Child Health and Develo ment*
B.S. 1969, Purdue University; M.D. 1973, University of Chicago

Thomas Herrick Milhorat, *Professor of Neurological Surgery and of Chi Health and Development*
B.S. 1957, M.D. 1961, Cornell University

Jack William Millar, *Vivian Gill Professor of Epidemiology and Environmenta Health*
B.A. 1945, Stanford University; M.D. 1947, George Washington University; M.P.H. 1951, M.S in Hygiene and Tropical Medicine 1952, Harvard University

Frank Nelson Miller, Jr., *Professor of Pathology*
B.S. 1943, M.D. 1948, George Washington University

George Edward Miller, *Assistant Research Professor of Radiology*
B.S. 1965, M.E.A. 1976, George Washington University

George Francis Miller, Jr., *Clinical Instructor in Otolaryngology*
M.D. 1958, George Washington University

Glenn Howard Miller, *Assistant Clinical Professor of Psychiatry and Be havioral Sciences*
B.A. 1962, University of Iowa; M.D. 1966, University of Chicago

Harry Charles Miller, Jr., *Professor of Urology; Chairman of the Departme of Urology*
B.A. 1950, Amherst College; M.D. 1954, Yale University

Judith Kimberly Miller, *Assistant Professorial Lecturer in Health Care Science*
B.A. 1965, George Washington University; M.A. 1969, Catholic University of America

Stanley Charles Miller, *Special Lecturer in Health Care Sciences*

Valery Thornton Miller, *Assistant Clinical Professor of Medicine*
B.A. 1958, M.D. 1961, George Washington University

Frances Kennedy Millican, *Adjunct Associate Professor of Psychiatry and Be havioral Sciences*
B.S. 1938, George Peabody College for Teachers; M.S. 1946, M.D. 1948, University of Tenne see

Richard Arthur Millington, *Associate Clinical Professor of Health Care Sci ences*
B.A. 1952, M.D. 1956, University of Iowa; M.S. 1961, University of Rochester; M.P.H. 1965 University of California, Berkeley

Dorothy Erica Millon, *Clinical Instructor in Medicine*
B.A. 1946, M.A. 1948, University of California, Los Angeles; M.D. 1955, University of Chicago

Mitchell Mills, *Clinical Professor of Surgery*
B.A. 1952, Princeton University; M.D. 1956, Cornell University

Barbara Rubel Milowe, *Assistant Clinical Professor of Psychiatry and Be havioral Sciences*
B.A. 1955, Sarah Lawrence College; M.D. 1959, The Medical College of Pennsylvania

Irvin Donald Milowe, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1953, Columbia University; M.D. 1957, Cornell University

Harvey Nelson Mininberg, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1960, Brandeis University; M.D. 1965, Yeshiva University

Martin Lloyd Minthorn, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1944, M.S. 1949, University of Nebraska; Ph.D. 1953, University of Illinois

Harold Stanley Mirsky, *Associate Clinical Professor of Medicine*
B.S. 1959, City University of New York, Brooklyn College; M.D. 1964, State University of New York Upstate Medical Center

Donald E. Mitchell, *Assistant Clinical Professor of Dermatology*
B.S. 1954, M.D. 1957, University of North Carolina

Joyce Marie Mitchell, *Instructor in Health Care Sciences (Emergency Medicine) and in Medicine*
B.S. 1972, Muhlenberg College; M.D. 1976, Georgetown University

Stephen Alexander Mitchell, *Special Lecturer in Health Care Sciences*
B.S. 1971, M.D. 1973, University of Michigan

Bernhard Theodore Mittemeyer, *Associate Clinical Professor of Urology*
B.S. 1952, Moravian College; M.D. 1956, Temple University

Sigmund Mittler, *Associate Clinical Professor of Radiology*
B.S. 1958, M.D. 1964, Universidad Central De Venezuela

Charles Robert Mock, *Assistant Professor of Child Health and Development*
B.A. 1959, M.D. 1963, University of Maryland

Albert Jay Modlin, *Associate Clinical Professor of Child Health and Development*
B.S. 1948, M.S. 1949, M.D. 1954, George Washington University

Barry Modlin, *Clinical Instructor in Otolaryngology*
B.S. 1958, M.S. 1959, M.D. 1963, George Washington University

Mahmood Mohamadi, *Assistant Clinical Professor of Medicine*
M.D. 1965, Tehran University

Andrew Bernard Molchon, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1963, Yale University; M.D. 1967, Tufts University

Gaetano Francis Molinari, *Professor of Neurology; Chairman of the Department of Neurology*
B.S. 1957, College of the Holy Cross; M.D. 1961, College of Medicine and Dentistry of New Jersey

William Patrick Monaghan, *Assistant Professorial Lecturer in Pathology*
B.S. 1968, Old Dominion University; M.S. 1973, Ph.D. 1975, Bowling Green State University

Allen Mendel Mondzac, *Associate Clinical Professor of Medicine*
B.A. 1958, M.D. 1961, George Washington University

Marvin Ian Mones, *Special Lecturer in Child Health and Development*
B.S. 1940, Villanova University; M.D. 1947, Johns Hopkins University

Alfred Leonard Moniot, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*
B.S. 1967, Manhattan College; M.D. 1971, Georgetown University

Richard J. Montali, *Assistant Clinical Professor of Pathology (Comparative Pathology)*
D.V.M. 1964, Cornell University

James Eugene Montgomery, *Special Lecturer in Pathology*
B.S. 1977, George Washington University

Terry William Moody, *Assistant Professor of Biochemistry*
B.S. 1972, California Institute of Technology; Ph.D. 1978, University of California, Berkeley

George Albert Morales, *Professor of Anesthesiology*
B.S. 1947, M.D. 1951, University of Mexico

Judith F. Morales, *Assistant Clinical Professor of Neurology and of Child Health and Development*
M.D. 1966, National University of Cordoba, Argentina

Thomas Edward Morgan, *Adjunct Professor of Medicine*
B.S. 1954, M.D. 1954, Duke University

Robert Warren Morris, *Clinical Instructor in Health Care Sciences*
B.S. 1971, Old Dominion University; B.S. 1976, George Washington University

E. Gnanaraj Moses, *Special Lecturer in Child Health and Development*
B.B.A. 1951, Spicer Memorial College, India; M.A. 1963, Howard University; Ph.D. 1968, University of Maryland

Don Thurston Mosher, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1953, M.D. 1956, University of Kansas

Herbert Alan Moskovitz, *Associate Clinical Professor of Medicine*
B.S. 1949, Georgia Institute of Technology; M.D. 1954, Emory University

Peter Alan Moskovitz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1965, Haverford College; M.D. 1969, Columbia University

Charles Bernard Mount, *Assistant Clinical Professor of Health Care Sciences*
B.S.N. 1974, University of Washington

Nasser Movassaghi, *Associate Professor of Child Health and Development*
Natural Science 1950, Rahnema College, Iran; M.D. 1956, University of Tehran

Richard Arthur Muesing, *Assistant Research Professor of Medicine and of Biochemistry*
B.S. 1960, Mankato State College; M.S. 1964, Ph.D. 1969, University of Illinois

Joel Carl Mulhauser, *Assistant Clinical Professor of Medicine*
B.A. 1967, University of Pennsylvania; M.D. 1971, University of Pittsburgh

Fitzhugh Mullan, *Adjunct Associate Professor of Health Care Sciences*
B.A. 1964, Harvard University; M.D. 1968, University of Chicago

Steven Anthony Muller, *Assistant Clinical Professor of Health Care Sciences*
B.Ch.E. 1963, Cornell University

William P. Mulloy, *Adjunct Associate Professor of Pathology*
B.S. 1949, Georgetown University; M.S. 1952, Columbia University; M.D. 1958, Lausanne University, Switzerland

Myron Irwin Murdock, *Clinical Instructor in Urology*
B.A. 1964, Boston University; M.D. 1968, George Washington University

Cornelius Francis Murphy, *Associate Clinical Professor of Radiology*
B.S. 1943, Boston College; M.D. 1956, Georgetown University

James Peter Murphy, *Associate Clinical Professor of Neurological Surgery*
B.S. 1935, College of St. Thomas; M.D. 1939, Yale University

Michael Owen Murphy, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1959, St. Ambrose College; M.D. 1963, Marquette University

Thomas Miles Murphy, *Assistant Professor of Child Health and Development*
A.B. 1969, Harvard University; M.D. 1973, University of Rochester

Francis James Murray, *Clinical Professor of Medicine*
B.S. 1936, University of Notre Dame; M.D. 1940, Cornell University

John Lee Murray, *Clinical Instructor in Radiology*
B.S. 1964, Bowling Green State University; M.S. 1973, California State University, San Diego

Sharon Lee Murray, *Assistant Professor of Child Health and Development*
B.A. 1963, University of Oregon; M.A. 1969, University of Kentucky; Ph.D. 1972, University of Kansas

Challakonda N. Murty, *Assistant Research Professor of Pathology*
B.S. 1960, Andhra University, India; M.S. 1962, Ph.D. 1965, Banaras Hindu University, India; Ph.D. 1969, University of Sydney, Australia

Charles Michael Myers, *Assistant Professorial Lecturer in Pathology*
B.S. 1966, University of Southern Mississippi; M.S. 1976, Georgia State University

Ntinos Myrianthopoulos, *Associate Clinical Professor of Neurology*
B.S. 1952, George Washington University; M.S. 1954, Ph.D. 1957, University of Minnesota

Peter John Nachajski, *Assistant Clinical Professor of Child Health and Development*
B.A. 1956, Brown University; M.D. 1960, George Washington University

Gurbux Hariram Nachnani, *Associate Clinical Professor of Medicine*
M.B., B.S. 1963, B.J. Medical College, University of Poona, India

Phyllis Faye Namrow, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1956, M.S.W. 1960, Boston University

Meenakshi Soman Nandedkar, *Assistant Clinical Professor of Pathology*
M.D. 1964, Nagpur University, India

Stephen Sanborn Nason, *Associate Professor of Orthopaedic Surgery and of Child Health and Development*
M.D. 1967, Tulane University

Cheryl Marco Naulty, *Assistant Professor of Child Health and Development*
B.A. 1968, University of Pennsylvania; M.D. 1972, Thomas Jefferson University

Keith Henderson Neblett, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1970, Howard University

Norton Herbert Neff, *Professorial Lecturer in Pharmacology*
B.S. 1958, M.S. 1960, Ph.D. 1964, Philadelphia College of Pharmacy and Science

Andris Neimanis, *Assistant Clinical Professor of Dermatology*
A.B. 1958, Harvard University; M.D. 1963, University of Rochester

Bertel Nelson, *Clinical Professor of Medicine*
B.A. 1945, M.D. 1948, George Washington University

Fred Ritchie Trew Nelson, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1963, Johns Hopkins University; M.D. 1967, University of Maryland

Karin Becker Nelson, *Associate Clinical Professor of Neurology and of Child Health and Development*
M.D. 1957, University of Chicago

Warren James Nelson, *Associate Clinical Professor of Radiology*
B.S. 1948, University of Wisconsin; M.D. 1953, George Washington University

Massoud Nemati, *Clinical Instructor in Medicine*
M.D. 1968, University of Tehran

Robert Jon Neviaser, *Professor of Orthopaedic Surgery*
B.A. 1958, Princeton University; M.D. 1962, Thomas Jefferson University

Thomas Jay Neviaser, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1962, University of Pennsylvania; M.D. 1966, George Washington University

Michael Arthur Newman, *Associate Clinical Professor of Medicine*
B.A. 1963, Stanford University; M.D. 1969, University of Rochester

Lorenz K. Ng, *Assistant Clinical Professor of Neurology*
B.A. 1961, Stanford University; M.D. 1965, Columbia University

Steven Mark Nichols, *Adjunct Instructor in Radiology (Nuclear Medicine Technology)*

Vernon Lowell Nickel, *Adjunct Professor of Orthopaedic Surgery and Medicine*
M.D. 1944, Loma Linda University; M.S. 1949, University of Tennessee, Memphis

Richard Austin Nicklas, *Assistant Clinical Professor of Medicine*
B.A. 1958, Cornell University; M.D. 1964, George Washington University

Judith Halsey Nicklason, *Adjunct Assistant Professor of Health Care Scien*

Honorato F. Nicodemus, *Assistant Clinical Professor of Anesthesiology*
M.D. 1962, Far Eastern University, Manila

Thomas Peter Nigra, *Clinical Professor of Dermatology*
B.A. 1963, St. Vincent College; M.D. 1967, University of Pennsylvania

Allen Abbe Nimetz, *Assistant Clinical Professor of Medicine*
B.A. 1964, M.D. 1968, Cornell University

Raymon Augusta Noble, *Assistant Clinical Professor of Medicine*
B.S. 1962, Iowa Wesleyan College; M.D. 1966, University of Missouri

Thomas Douglas Noble, *Clinical Professor of Psychiatry and Behavior Sciences*
B.A. 1924, M.B. 1927, M.D. 1936, University of Toronto

Nicholas George Nolan, *Associate Clinical Professor of Radiology*
M.B., Ch.B., B.A.O. 1963, B.S. 1965, National University of Ireland

Joseph Anthony Noronha, *Clinical Instructor in Health Care Sciences*
M.D. 1966, Mysore Medical College, India

Richard Howard Norton, *Adjunct Associate Professor of Anesthesiology*
B.A. 1954, M.D. 1958, University of Pennsylvania

Joseph Dove Noshpitz, *Professor of Psychiatry and Behavioral Sciences and Child Health and Development*
B.A. 1943, M.D. 1945, University of Louisville

Robert Allen Nover, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1961, Union College, New York; M.D. 1965, State University of New York Upstate Medical Center

John Francis Nowell, *Clinical Instructor in Ophthalmology*
B.S. 1954, M.D. 1956, University of Maryland

James C. Noyes, *Clinical Instructor in Health Care Sciences*
B.S. 1977, George Washington University

James William Oberman, *Associate Professor of Child Health and Development*
M.D. 1949, Georgetown University

Allen Albert Oboler, *Assistant Clinical Professor of Medicine*
M.D. 1966, Wayne State University

Daniel Warne Ochsenschlager, *Assistant Professor of Child Health and Development*
B.S. 1964, Beloit College; M.D. 1968, Marquette University

Joseph M. Brian O'Connell, *Associate Professor of Medicine*
M.B., Ch.B., B.A.O. 1957, University College, Ireland

John Joseph O'Connor, *Assistant Clinical Professor of Surgery*
B.A. 1962, M.D. 1966, State University of New York at Buffalo

Jay Alan Ocuin, *Assistant Clinical Professor of Medicine*
B.A. 1964, University of Vermont; M.D. 1971, University of Bologna, Italy

Norman A. Odyniec, *Assistant Clinical Professor of Surgery*
B.S. 1959, University of Notre Dame; M.D. 1963, Georgetown University

Yolanda Castillo Oertel, *Associate Professor of Pathology*
M.D. 1965, University of Peru

Tae Hee Oh, *Associate Professor of Anesthesiology and of Child Health and Development*
M.D. 1964, Seoul National University

Chukuemeka Obinna Okehi, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, University of Colorado; M.D. 1975, George Washington University

Donald Ary O'Kieffe, *Associate Clinical Professor of Medicine*
B.A. 1960, M.D. 1964, Yale University

Andres Olaciregui, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1958, Biffi-LaSalle University, Colombia; M.D. 1966, Universidad Javeriana, Colombia

Peter Dean Olch, *Professorial Lecturer in Pathology (History of Medicine)*
B.A. 1951, Pomona College; M.D. 1955, Johns Hopkins University

Dennis Sophian O'Leary, *Professor of Medicine and of Pathology (Laboratory Medicine); Dean of the Medical Center, for Clinical Affairs*
B.A. 1960, Harvard University; M.D. 1964, Cornell University

Mary Ellen Phillips Oliveri, *Assistant Research Professor of Psychiatry and Behavioral Sciences (Psychology)*
B.A. 1971, Trinity College, District of Columbia; M.A. 1973, Ph.D. 1975, Johns Hopkins University

William Wells Olmsted, *Professor of Radiology*
B.A. 1963, Williams College; M.D. 1968, University of Rochester; M.S. 1972, University of California, Los Angeles

Bennett Olshaker, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1943, M.D. 1945, George Washington University

Ayub Khan Ommaya, *Clinical Professor of Neurological Surgery*
M.D. 1953, King Edward Medical College; M.A. 1960, Oxford University

John Francis O'Neill, *Assistant Clinical Professor of Ophthalmology and of Child Health and Development*
B.S. 1952, Mount St. Mary's College, Maryland; M.D. 1956, Georgetown University

Beale Hibbs Ong, *Associate Clinical Professor of Child Health and Development*
B.A. 1955, M.D. 1959, George Washington University

Olugbenga Soga Oredein, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1970, Alma College; M.D. 1974, Howard University

Sean O'Reilly, *Professor of Neurology*
M.B. 1949, M.D. 1952, National University of Ireland

Jan Marc Orenstein, *Assistant Professor of Pathology*
B.A. 1963, Johns Hopkins University; Ph.D. 1969, M.D. 1971, State University of New York Downstate Medical Center

Ronald Julian Orleans, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1965, Franklin and Marshall College; M.D 1969, George Washington University

George M. Orr, *Assistant Clinical Professor of Medicine*
B.S. 1971, M.D. 1975, University of Pittsburgh

Louis G. Ortega, *Associate Professor of Pathology*
M.D. 1946, New York Medical College

Mario R. Ortega, *Assistant Clinical Professor of Child Health and Development*
M.D. 1965, University of San Carlos

Helmuth F. Orthner, *Associate Professor of Clinical Engineering*
Dipl.Ing. 1966, Technical University of Munich; Ph.D. 1973, University of Pennsylvania

Morris A. Osborn, *Assistant Clinical Professor of Neurology*
M.D. 1963, University of Miami

Raphael Joseph Osheroff, *Assistant Clinical Professor of Medicine*
B.A. 1959, Columbia University; M.D. 1963, Creighton University

Bernard Howard Ostrow, *Assistant Clinical Professor of Medicine*
B.A. 1944, Miami University; M.D. 1948, George Washington University

Neil Stuart Otchin, *Assistant Clinical Professor of Medicine*
B.S. 1963, University of Florida; M.D. 1967, Duke University

John Edward Ott, *Professor of Health Care Sciences and of Child Health and Development; Chairman of the Department of Health Care Sciences*
B.S. 1959, M.D. 1963, University of Pittsburgh

Victoria Vroom Ott, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.S. 1964, Moravian College; M.D. 1968, The Medical College of Pennsylvania

Gilbert Ottenberg, *Assistant Clinical Professor of Urology*
B.A. 1922, M.A. 1924, M.D. 1928, George Washington University

Ronald Ottenberg, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1956, M.D. 1959, George Washington University

Leslie William Ouderkirk, *Lecturer in Pathology*
B.A. 1975, Chadron State College

Kathleen Leinau Owens, *Clinical Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1954, M.A. 1962, University of California, Berkeley; M.S.W. 1969, Howard University

Mark Norman Ozer, *Associate Research Professor of Child Health and Development*
B.A. 1953, Harvard University; M.D. 1957, Boston University

Pedro Mario Pabon, *Assistant Professor of Anesthesiology*
A.B. 1955, Polytechnic Institute of Puerto Rico; M.D. 1959, George Washington University

Russel Smith Page, Jr., *Associate Clinical Professor of Otolaryngology*
B.A. 1936, Dartmouth College; M.D. 1940, University of Vermont

Chang Hum Paik, *Associate Research Professor of Radiology (Nuclear Medicine)*
B.S. 1963, Inha Institute of Technology; Ph.D. 1972, University of California, Santa Cruz

Richard Emery Palmer, *Clinical Professor of Pathology*
B.A., M.D. 1944, George Washington University

Richard Roy Palmer, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, Harvard University; M.D. 1971, Georgetown University

Garsutis Kazimieras Palys, *Adjunct Instructor in Psychiatry and Behavioral Sciences*
B.S. 1969, St. John's University; M.D. 1973, State University of New York at Buffalo

John C. Pan, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1966, University of Notre Dame; M.D. 1970, George Washington University

Nicholas J. Papadopoulos, *Visiting Professor of Anatomy*
M.D. 1962, Ph.D. 1968, Athens University

Stephen Stavros Pappas, *Assistant Clinical Professor of Ophthalmology*
B.S. 1952, M.D. 1956, George Washington University

Soo Woong Park, *Assistant Clinical Professor of Medicine*
M.D. 1969, Seoul National University

Edwin Pearson Parker III, *Clinical Professor of Medicine*
B.S. 1939, M.D. 1942, University of Virginia

Matthew Allen Parker, *Assistant Professor of Medicine*
B.A. 1971, University of Rochester; M.D. 1975, New York Medical College

Dee Rich Parkinson, *Associate Clinical Professor of Pathology*
M.D. 1943, George Washington University

Marshall Miller Parks, *Clinical Professor of Ophthalmology and of Child Health and Development*
B.A. 1939, Illinois College; M.D. 1943, St. Louis University

Harry Leslie Parlette III, *Special Lecturer in Health Care Sciences*
B.S. 1964, Washington and Lee University; M.D. 1968, Georgetown University

Alvin Edward Parrish, *Professor of Medicine; Director of Clinical Research, Medical Center*
M.D. 1945, George Washington University

Robert Harold Parrott, *Professor of Child Health and Development; Chairman, Department of Child Health and Development*
M.D. 1949, Georgetown University

Diane Brickley Parsons, *Associate Research Professor of Orthopaedic Surgery and of Anatomy*
B.A. 1967, Newton College; Ph.D. 1972, Boston University

Michael Allen Paske, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1972, Baker University

Rameschandra I. Patel, *Instructor in Anesthesiology and in Child Health and Development*
M.B., B.S. 1975, University of Baruda

Warren Edward Patow, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1947, Albion College; M.D. 1947, Marquette University

Bentley Lorene Patterson, *Clinical Instructor in Dermatology*
B.S. 1970, Spelman College; M.D. 1974, Harvard University

Daniel Young Patterson, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, M.D. 1966, University of Kentucky; M.P.H. 1970, Johns Hopkins University

Robert Harry Patterson, *Assistant Professor of Pathology*
B.A. 1965, Bridgewater College; M.D. 1969, George Washington University

Leonard Gregory Pawlson, *Associate Professor of Health Care Sciences and of Medicine*
B.S. 1965, Pennsylvania State University; M.D. 1969, University of Pittsburgh

Beneta Jane Peacock, *Assistant Professor of Child Health and Development*
B.A. 1946, Mary Baldwin College; M.D. 1965, New York University

Jed Williams Pearson, Jr., *Clinical Professor of Obstetrics and Gynecology*
B.A. 1934, DePauw University; M.D. 1938, Indiana University at Indianapolis

Charles Albert Peck, Jr., *Assistant Professor of Surgery*
B.S. 1961, Ohio University; M.D. 1965, University of Cincinnati

Roland Lee Peckham, *Special Lecturer in Pathology*

Frank Alan Pedreira, *Associate Clinical Professor of Child Health and Dev*
ment
B.A. 1959, Rutgers—The State University; M.D. 1963, State University of New York U
Medical Center

Paul Thomas Peebles, *Associate Clinical Professor of Child Health and*
velopment
B.S. 1963, John Carroll University; M.D. 1967, Case Western Reserve University

Roger Peele, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1955, University of North Carolina; M.D. 1960, University of Tennessee

John Calvin Perkins, *Assistant Clinical Professor of Medicine*
B.A. 1956, M.D. 1960, Harvard University

Walter Reams Perkins, *Assistant Clinical Professor of Obstetrics and Gy*
cology
B.S. 1957, University of Richmond; M.D. 1961, Medical College of Virginia of Virginia C
monwealth University

Stanley Morton Perl, *Clinical Instructor in Radiology*
B.A. 1960, Brown University; M.D. 1964, University of Pittsburgh

Elliott Perlin, *Assistant Professor of Medicine*
B.S. 1957, George Washington University; M.D. 1961, Thomas Jefferson University

Seymour Perlin, *Professor of Psychiatry and Behavioral Sciences*
B.A. 1947, Princeton University; M.D. 1950, Columbia University

Louis Robert Perna, *Assistant Clinical Professor of Surgery*
B.A. 1950, M.D. 1953, George Washington University

Louis Edward Perraut, *Clinical Instructor in Ophthalmology*
B.A. 1945, University of Kentucky; M.D. 1946, University of Louisville

Lowell Wesley Perry, *Professor of Child Health and Development*
B.S. 1956, Albright College; M.D. 1960, Temple University

Thomas Albert Peters, *Special Lecturer in Radiology (Nuclear Medicine Tec*
nology)

Kent Albrecht Peterson, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1956, M.D. 1959, George Washington University

William Frank Peterson, *Assistant Clinical Professor of Obstetrics and Gyn*
cology
M.D. 1946, New York Medical College

Stojmil V. Petkov, *Assistant Professor of Anesthesiology*
M.D. 1961, University of Zagreb, Yugoslavia

Stephen Donohoe Pett, *Assistant Professor of Surgery*
B.S. 1967, Seton Hall University; M.D. 1971, George Washington University

Michael M. Phillips, *Assistant Clinical Professor of Medicine*
B.A. 1962, City University of New York, Brooklyn College; M.D. 1967, State University o
New York at Buffalo

Steve Richard Pieczenik, *Assistant Clinical Professor of Psychiatry and Behav*
ioral Sciences
B.A. 1964, M.D. 1968, Cornell University

Thomas Eugene Piemme, *Professor of Health Care Sciences and of Medicine*
Director of the Office of Continuing Medical Education
B.S. 1954, M.D. 1958, University of Pittsburgh

Lawrence Pierce, *Professor of Medicine*
M.D. 1955, Georgetown University

Leslie Harrell Pierce, Jr., *Assistant Professor of Medicine*
B.A. 1965, Williams College; M.D. 1969, University of Maryland

Roger James Pierce, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1964, George Washington University; M.D. 1968, Georgetown University

Howard Clemeth Pierpont, *Associate Professor of Surgery*
B.A. 1939, Marietta College; M.D., C.M. 1943, McGill University

Dean Lawrence Pierson, *Assistant Clinical Professor of Dermatology*
B.S. 1962, M.P.H. 1963, University of California, Berkeley; M.D. 1967, Temple University

Harold Alan Pincus, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Health Care Sciences*
B.A. 1972, University of Pennsylvania; M.D. 1975, Yeshiva University

Esther Anita Garner Pinder, *Clinical Instructor in Child Health and Development*
B.S. 1965, City University of New York, City College; M.D. 1969, Howard University

Hanna Zulauf Pipberger, *Assistant Research Professor of Clinical Engineering*
B.A. 1942, Teachers College, Switzerland

Hubert Vincent Pipberger, *Professor of Clinical Engineering and of Medicine*
B.A. 1938, Deutsches Kollege, Germany; M.D. 1951, Rheinische Friedrich Wilhelms University, Germany

Charles E. Piper, *Adjunct Assistant Professor of Microbiology*
B.S. 1967, Wisconsin State University; M.S. 1970, Ph.D. 1972, Washington State University

Joseph Michael Pisani, *Associate Clinical Professor of Medicine*
B.A. 1938, Fordham University; M.D. 1942, New York University

Mark Melvin Platt, *Associate Professor of Neurology and of Child Health and Development*
B.A. 1962, M.D. 1966, University of Vermont

Elizabeth Moore Plionis, *Assistant Research Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, College of St. Catherine; M.S.W. 1968, University of Minnesota; D.S.W. 1976, University of Maryland

Dov Herbert Pluznik, *Visiting Professor of Biochemistry*
M.S. 1962, The Hebrew University, Israel; Ph.D. 1966, The Weizmann Institute of Science, Israel

George Nicholas Polis, *Assistant Clinical Professor of Medicine*
B.S. 1951, Georgetown University; M.D. 1955, University of Maryland

Murray Michael Pollack, *Assistant Professor of Anesthesiology and of Child Health and Development*
B.A. 1970, University of Rochester; M.D. 1974, Yeshiva University

David Pope, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.B., Ch.B. 1957, St. Andrews University, Scotland

Valery Alexander Portnoi, *Associate Professor of Health Care Sciences and of Medicine*
M.D. 1962, Medical Institute of Kuban, U.S.S.R.

Jerrold Morton Post, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1956, M.D. 1960, Yale University

Phillip William Poth, *Assistant Clinical Professor of Medicine*
B.S. 1968, Texas A&M University; M.D. 1972, Tulane University

Barry M. Potter, *Associate Professor of Radiology and of Child Health and Development*
B.A. 1963, City University of New York, Brooklyn College; M.D. 1967, State University of New York Downstate Medical Center

Gail Judith Povar, *Assistant Professor of Health Care Sciences and of Med*
B.A. 1972, Cornell University; M.P.H. 1977, University of Michigan; M.D. 1977, Univers
Vermont

Virginia Elizabeth Powell, *Assistant Clinical Professor of Psychiatry and*
havioral Sciences and of Child Health and Development
A.B. 1949, Goucher College; M.D. 1953, Harvard University

Neel Jack Price, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1939, B.S. 1940, M.D. 1942, University of Oklahoma

Louis Quain Pugsley, *Associate Clinical Professor of Obstetrics and Gynecol*
B.A. 1954, Hamilton College; M.D. 1958, Cornell University

Robert Earl Pumphrey, Jr., *Clinical Professor of Otolaryngology*
B.S. 1955, Denison University; M.D. 1959, Ohio State University

Frank Brian Purvis, *Assistant Clinical Professor of Health Care Sciences*
B.A. 1973, Central Methodist College; M.D. 1977, University of Missouri

Jerome Stuart Putnam, *Assistant Clinical Professor of Medicine*
B.A. 1965, Dartmouth College; M.D. 1969, Tufts University

James Tindal Quattlebaum, *Associate Clinical Professor of Psychiatry and B*
havioral Sciences
B.S. 1955, University of South Carolina; M.D. 1956, Medical University of South Caro
M.A. 1961, Columbia University

John William R-Love, *Assistant Clinical Professor of Psychiatry and Behavi*
al Sciences
B.A. 1960, M.D. 1964, Emory University

Boris Rabkin, *Assistant Clinical Professor of Medicine*
B.A. 1939, New York University; M.D. 1943, George Washington University

Alan Saul Rabson, *Professorial Lecturer in Pathology*
B.A. 1948, University of Rochester; M.D. 1950, State University of New York Downstate Me
ical Center

Anis Racy, *Assistant Professor of Neurology*
B.S. 1967, M.D. 1971, American University of Beirut

Luis Carlos Radice, *Assistant Clinical Professor of Obstetrics and Gynecol*
M.D. 1957, University of Buenos Aires

Thomas Justin Radley, *Associate Clinical Professor of Orthopaedic Surgery*
M.D. 1942, University of Cincinnati

Thomas Gilman Rainey, *Assistant Clinical Professor of Anesthesiology*
A.B. 1970, M.D. 1974, Duke University

Devanhalli Ramaswamy, *Assistant Clinical Professor of Medicine*
M.D. 1961, University of Mysore

James North Ramey, *Assistant Clinical Professor of Medicine*
B.A. 1964, Amherst College; M.D. 1968, Columbia University

Arthur Ernest Randall, *Special Lecturer in Health Care Sciences*

Judson Graves Randolph, *Professor of Surgery and of Child Health and Devel*
opment
B.A. 1950, M.D. 1953, Vanderbilt University

Joseph Eugene Rankin, *Professor of Psychiatry and Behavioral Sciences*
B.S. 1942, Catholic University of America; M.D. 1946, George Washington University

Judith Livant Rapoport, *Clinical Professor of Psychiatry and Behavioral Sci*
ences and of Child Health and Development
B.A. 1955, Swarthmore College; M.D. 1959, Harvard University

Harold Elton Ratcliffe, *Professor of Medicine*
B.A. 1935, M.D. 1939, Tulane University

Richard Albert Ratner, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, University of Chicago; M.D. 1966, University of Pennsylvania

Pawah K. Rattan, *Clinical Instructor in Obstetrics and Gynecology*
M.B., B.S. 1972, Amritjar Medical College, India

Kent Ravenscroft, Jr., *Associate Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1962, Yale University; M.D. 1966, Harvard University

Sheila Eileen Hamburg Raviv, *Assistant Professorial Lecturer in Health Care Sciences*
B.A. 1964, Indiana University

James Lamar Read, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1949, M.D. 1953, University of Maryland

Gregory H. Reaman, *Assistant Professor of Child Health and Development*
B.S. 1969, University of Detroit; M.D. 1973, Loyola University of Chicago

Richard Charney Reba, *Professor of Radiology (Nuclear Medicine) and of Medicine*
M.D. 1957, University of Maryland

Thomas Sargent Reese, *Professorial Lecturer in Anatomy*
B.A. 1957, Harvard University; M.D. 1962, Columbia University

Richard Brian Reff, *Assistant Professor of Orthopaedic Surgery and of Child Health and Development*
B.A. 1969, M.D. 1972, George Washington University

Claude Virgil Reich, *Associate Research Professor of Microbiology*
B.S. 1953, Ph.D. 1958, Pennsylvania State University; M.S. 1954, University of Wisconsin

Melvin Reich, *Professor of Microbiology*
B.S. 1953, City University of New York, City College; M.S. 1957, Ph.D. 1960, Rutgers—The State University

David Reiss, *Professor of Psychiatry and Behavioral Sciences and of Medicine*
B.A. 1958, M.D. 1962, Harvard University

Clarence Arnold Renschler, *Assistant Clinical Professor of Child Health and Development*
B.A. 1964, Walla Walla College; M.D. 1968, Loma Linda University

Philip Louis Repetto, Jr., *Associate Clinical Professor of Dermatology*
B.A. 1951, M.D. 1955, University of Pennsylvania

Harvey L. P. Resnik, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, State University of New York at Buffalo; M.D. 1955, Columbia University

Frederick Turner Reuter, *Clinical Professor of Urology*
M.D. 1944, George Washington University

Walter Albert Rey, *Lecturer in Pathology*
B.S. 1975, University of North Dakota

Richard Coleman Rhame, *Assistant Clinical Professor of Urology*
B.A. 1950, Princeton University; M.D. 1954, George Washington University

Jack Jacob Rheingold, *Clinical Professor of Medicine*
B.A. 1936, University of Alabama; M.B. 1940, M.D. 1941, University of Cincinnati

Harvey William Rice, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1955, West Virginia Wesleyan College; M.D. 1959, University of Cincinnati

Linda Jo Rice, *Special Lecturer in Health Care Sciences*
B.S. 1973, M.D. 1977, University of Kentucky

Jeffrey I. Rich, *Assistant Professor of Radiology*
B.A. 1970, Case Western Reserve University; M.D. 1974, State University of New York D
state Medical Center

Douglas Scott Richardson, *Special Lecturer in Health Care Sciences*
A.B. 1967, Bucknell University; M.D. 1971, State University of New York at Buffalo

Sanford Norman Richman, *Assistant Clinical Professor of Medicine*
B.S. 1960, University of Georgia; M.D. 1964, Medical College of Georgia

Ruth Stone Richmond, *Adjunct Assistant Professor of Psychiatry and Behavi*
Sciences (Social Work)
B.A. 1937, Goucher College; M.S.W. 1969, Catholic University of America

Kenneth C. Rickler, *Assistant Clinical Professor of Neurology and of Psychi*
and Behavioral Sciences
B.A. 1968, Cornell University; M.D. 1972, State University of New York at Buffalo

Patrick Joseph Riddle, *Assistant Professor of Ophthalmology*
M.D. 1971, Creighton University

Garrett Vernon Ridgley, Jr., *Assistant Clinical Professor of Medicine*
B.A. 1970, Princeton University; M.D. 1974, Howard University

Richard Kenneth Riegelman, *Assistant Professor of Health Care Sciences a*
of Medicine
M.D. 1973, University of Wisconsin; M.P.H. 1975, Johns Hopkins University

Rebecca Eisenberg Rieger, *Clinical Professor of Child Health and Develop*
and of Psychiatry and Behavioral Sciences
B.A. 1940, City University of New York, Hunter College; M.A. 1941, Columbia Univer
M.A. 1952, Ph.D. 1960, Catholic University of America

Kenneth Gerard Rieth, *Assistant Clinical Professor of Radiology*
B.S. 1969, Boston College; M.D. 1973, St. Louis University

Monira K. Rifaat, *Assistant Clinical Professor of Pathology*
M.B., Ch.B. 1961, Alexandria University; M.A. 1964, Boston University

Charles Andrew Rigg, *Associate Professor of Child Health and Development*
M.B., B.Surg. 1951, University of Sydney, Australia; M.R.A.C.P. 1955, F.R.A.C.P. 1968, Ro
Australian College of Physicians

Dale Alan Riggs, *Special Lecturer in Health Care Sciences*

Rita Coronado Rigor-Matory, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1965, University of Santo Tomas, Philippines

Jorge Carlos Rios, *Eugene Meyer Professor of Medicine; Chairman, Depar*
ment of Medicine
M.D. 1959, University of Buenos Aires

Surendra Ramchandra Rishi, *Clinical Instructor in Medicine*
M.B., B.S. 1953, M.D. 1957, University of Bombay

Robert Sheldon Rixse, *Assistant Clinical Professor of Child Health and De*
velopment
B.A. 1967, Johns Hopkins University; M.D. 1972, Duke University

Hugo Victor Rizzoli, *Professor of Neurological Surgery; Chairman of the De*
partment of Neurological Surgery
B.A. 1936, M.D. 1940, Johns Hopkins University

Alice Jeannette Roach, *Assistant Professor of Radiology*
B.A. 1965, North Texas State University; M.D. 1971, University of Texas, Southwestern Me
cal School at Dallas

Morton Jay Roberts, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1964, Franklin and Marshall College; M.D. 1968, George Washington University

Stephen Gale Roberts, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1971, Morehouse College; M.D. 1975, Howard University

William Clifford Roberts, *Professorial Lecturer in Medicine and in Pathology (Cardiology)*
B.A. 1954, Southern Methodist University; M.D. 1958, Emory University

Carolyn Bauer Robinowitz, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1959, Wellesley College; M.D. 1964, Washington University

Albert Irving Robins, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1937, George Washington University; M.D. 1941, Georgetown University

Douglas Neil Robins, *Assistant Clinical Professor of Dermatology, of Medicine, and of Child Health and Development*
B.S. 1965, Washington and Lee University; M.D. 1969, George Washington University

Joseph Daniel Robinson, *Assistant Clinical Professor of Medicine*
B.A. 1965, Princeton University; M.D. 1970, Yale University

Luther Dabney Robinson, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1943, Virginia State College; M.D. 1946, Meharry Medical College

Mary Evans Robinson, *Associate Clinical Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1951, Mary Baldwin College; M.S. 1953, George Washington University; Ph.D. 1959, Purdue University

Richard G. Robinson, *Assistant Professor of Medicine*
A.B. 1971, Oberlin College; M.D. 1975, Cornell University

William David Roche, Jr., *Assistant Clinical Professor of Health Care Sciences*
B.S. 1960, University of Notre Dame; M.D. 1964, Tufts University

Bruce Robert Rock, *Adjunct Instructor in Radiology*

S. David Rockoff, *Professor of Radiology*
B.A. 1951, Syracuse University; M.D. 1955, Albany Medical College of Union University; M.S. 1961, University of Pennsylvania

Harold Irvin Rodman, *Clinical Instructor in Ophthalmology*
B.A. 1952, Johns Hopkins University; M.D. 1956, University of Maryland

Orlando Gilbert Rodman, *Associate Clinical Professor of Dermatology*
B.A. 1961, Valparaiso University; M.D. 1965, Howard University

Chalon Rodriguez, *Associate Clinical Professor of Urology*
M.D. 1943, University of Havana, Cuba

William Julio Rodriguez, *Associate Professor of Child Health and Development*
B.S. 1963, M.D. 1967, Ph.D. 1975, Georgetown University

Charles Clanton Rogers, *Professor of Radiology (Radiation Therapy) and of Obstetrics and Gynecology*
B.A. 1956, Maryville College, Tennessee; M.D. 1960, University of Arkansas

Richard Allan Rogers, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1941, University of Washington; M.D. 1944, Northwestern University

Prashant Kumar Rohatgi, *Assistant Professor of Medicine*
M.B., B.S. 1969, All India Institute of Medical Sciences

Manouchehr Rokni, *Clinical Instructor in Child Health and Development*
M.D. 1960, University of Tehran

Monroe James Romansky, *Professor of Medicine*
B.A. 1933, University of Maine at Orono; M.D. 1937, University of Rochester

Nancy Josette Ronsheim, *Clinical Instructor in Ophthalmology*
B.S. 1964, M.D. 1971, Cornell University; M.A.T. 1965, Harvard University

Morton Harold Rose, *Assistant Clinical Professor of Medicine*
M.D. 1942, George Washington University

Leonard Asher Rosen, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, M.D. 1976, George Washington University

Arthur Bernard Rosenbaum, *Clinical Professor of Medicine and of Health Sciences*
B.S. 1931, City University of New York, City College; M.D. 1935, New York University

Kenneth Neil Rosenbaum, *Assistant Professor of Child Health and Development*
B.S. 1968, M.D. 1971, University of Louisville

Meyer Rosenbaum, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1942, M.D. 1944, Tulane University

Joel Rosenberg, *Assistant Clinical Professor of Medicine*
B.A. 1969, Washington University; M.D. 1973, Tulane University

Steven Aaron Rosenberg, *Associate Professor of Surgery*
B.A. 1960, M.D. 1963, Johns Hopkins University; Ph.D. 1968, Harvard University

Stephen Rosenblum, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1963, Amherst College; M.D. 1967, Columbia University

Jeffrey Mark Rosenstein, *Assistant Professor of Anatomy*
B.A. 1971, Kent State University; Ph.D. 1976, Pennsylvania State University

Marvin Rosenstein, *Assistant Clinical Professor of Radiology (Radiation Physics)*
B.S. 1961, Ph.D. 1971, University of Maryland; M.S. 1966, Rensselaer Polytechnic Institute

Douglas Roy Rosing, *Associate Clinical Professor of Medicine*
B.A. 1963, Princeton University; M.D. 1967, State University of New York at Buffalo

Allan Michael Ross, *Professor of Medicine*
B.A. 1960, Northwestern University; M.D. 1964, University of Health Sciences/Chicago Medical School

Michael A. Ross, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1971, Dickinson College; M.D. 1975, George Washington University

Sydney Ross, *Clinical Professor of Child Health and Development*
B.S. 1940, M.D. 1943, Harvard University

Rufus Rosser, Jr., *Clinical Instructor in Obstetrics and Gynecology*
B.S. in E.E. 1968, M.D. 1976, Howard University

Barry Stephen Rothman, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, M.D. 1975, George Washington University

Gerald Rothman, *Clinical Instructor in Surgery (Oral Surgery)*
B.A. 1966, D.D.S. 1971, Temple University

Stanley Roy Rothschild, *Assistant Clinical Professor of Orthopaedic Surgery*
B.S. 1964, City University of New York, Queens College; M.D. 1968, State University of New York Upstate Medical Center

Alberto Rotsztain, *Assistant Clinical Professor of Medicine*
M.D. 1963, University of Buenos Aires

Irwin Winn Rovner, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, M.D. 1953, University of Iowa

Norman Hartley Rubenstein, *Assistant Clinical Professor of Medicine*
M.D. 1950, George Washington University

Bruce Edward Rubin, *Associate Clinical Professor of Radiology*
B.S. 1964, City University of New York, City College; M.D. 1968, Columbia University

Jesse Gallant Rubin, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1953, Franklin and Marshall College; M.D. 1957, Yale University

Philip Rubovits-Seitz, *Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1944, University of Pennsylvania

Randi Rubovits-Seitz, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1968, Washington University; M.D. 1972, University of Illinois Medical Center at Chicago

Roger Norris Ruckman, *Assistant Professor of Child Health and Development*
B.A. 1966, Williams College; M.D. 1970, University of Virginia

Lily Ruckstuhl, *Clinical Instructor in Medicine*
M.D. 1954, University of Geneva

Cesar Rudzki, *Associate Clinical Professor of Medicine*
M.D. 1961, University of Buenos Aires; M.P.H. 1969, Johns Hopkins University

Marshall deGraffenried Ruffin, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1932, University of Virginia; M.D. 1936, Harvard University

Daniel August Ruge, *Professorial Lecturer in Neurological Surgery*
B.A. 1939, North Central College; M.D. 1945, M.S. 1949, Ph.D. 1961, Northwestern University

Edward Jerome Ruley, *Associate Professor of Child Health and Development*
B.S. 1960, The Citadel; M.D. 1964, University of Maryland

Arthur Ruskin, *Associate Clinical Professor of Medicine*
B.S. 1932, City University of New York, City College; M.D. 1936, New York University

Surendra Nath Rustgi, *Assistant Professor of Radiology*
B.S. 1968, M.S. 1970, Delhi University; Ph.D. 1974, State University of New York at Buffalo

Urs Eugene Ruttimann, *Associate Research Professor of Child Health and Development*
M.S. in E.E. 1966, Swiss Federal Institute of Technology; Ph.D. 1972, University of Pennsylvania

Frank Michael Ryan, *Assistant Clinical Professor of Medicine*
B.S. 1970, St. Joseph's College, Pennsylvania; M.D. 1974, Pennsylvania State University

Waclaw Janusz Rzeszotarski, *Associate Research Professor of Radiology (Nuclear Medicine)*
M.Sc. 1959, Institute of Technology, Poland; Ph.D. 1964, Polish Academy of Sciences

Joseph Aziz Sabri, *Associate Clinical Professor of Otolaryngology*
B.A. 1941, M.D. 1946, American University of Beirut

Fernando F. Sacasa, *Assistant Clinical Professor of Surgery (Oral Surgery)*
D.D.S. 1935, Georgetown University

Nedzib Sacirbey, *Clinical Instructor in Psychiatry and Behavioral Sciences*
M.D. 1955, University of Zagreb, Yugoslavia

Josiah Sacks, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1951, Providence College; M.D. 1955, Tufts University

Harold Charles Sadin, *Associate Clinical Professor of Medicine*
B.A. 1948, Hamilton College; M.D. 1952, Albany Medical College of Union University

William James Sadlack, *Adjunct Instructor in Orthopaedic Surgery*
B.S. 1964, St. Peter's College; M.D. 1971, St. Louis University

Julian Edwin Safran, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1972, M.D. 1975, George Washington University

Alan Robert Sager, *Assistant Clinical Professor of Psychiatry and Behavi Sciences*
B.A. 1964, Rutgers—The State University; M.D. 1969, Boston University

John Harmer Sager, *Clinical Instructor in Surgery*
B.A. 1948, Princeton University; M.D. 1952, George Washington University

Nirmal K. Saini, *Associate Professor of Pathology*
M.B., B.S. 1957, King Edward Medical College, India

Hernando Salcedo, *Assistant Clinical Professor of Urology*
B.S. 1955, University College, Colombia; M.D. 1962, Javeriana University, Colombia

Jose Rodofo Salcedo, *Assistant Professor of Child Health and Developme*
M.D. 1970, Guadalajara State University, Mexico

Alen Johannes Salerian, *Assistant Clinical Professor of Psychiatry and havioral Sciences*
M.D. 1971, University of Istanbul

Patricia Carol Sandiford, *Clinical Instructor in Child Health and Develop*
M.D. 1971, Howard University

Allen H. Sandler, *Assistant Clinical Professor of Psychiatry and Behavio Sciences*
B.A. 1966, Yale University; M.D. 1970, New York University

Melvin Wesley Sandmeyer, Jr., *Assistant Clinical Professor of Obstetrics Gynecology*
B.A. 1950, M.D. 1953, George Washington University

Lawrence I. Sank, *Associate Professor of Health Care Sciences and of Psy atry and Behavioral Sciences*
B.A. 1968, Brandeis University; M.S. 1970, Ph.D. 1972, Rutgers—The State University

Philip Jay Santora, *Assistant Clinical Professor of Psychiatry and Behavio Sciences*
B.S. 1966, Le Moyne College; M.D. 1970, St. Louis University

Thomas Stone Sappington, *Clinical Professor of Medicine*
B.A. 1937, M.D. 1941, Harvard University

Rajindra Kumar Sarin, *Associate Clinical Professor of Medicine*
M.B., B.S. 1962, Panjab University, India

David Satinsky, *Assistant Clinical Professor of Neurology*
B.A. 1960, M.D. 1964, University of Pennsylvania

Bertram Jacob Lyons Sauerbrunn, *Professor of Radiology (Nuclear Medici*
B.S. 1936, Lafayette College; M.D. 1940, Albany Medical College of Union University

Robert Clarence Saunders, *Assistant Professor of Medicine*
B.A. 1962, University of Washington; M.D. 1967, George Washington University

Sumner Alan Savitz, *Assistant Clinical Professor of Psychiatry and Behavio Sciences*
B.S. 1957, Massachusetts Institute of Technology; M.D. 1961, Tufts University

Larry Dale Saxton, *Lecturer in Pathology*
B.A. 1977, Laverne College; M.B.A. 1980, National University

Raymond Scalettar, *Clinical Professor of Medicine*
B.A. 1950, Columbia University; M.D. 1954, State University of New York Downstate Medi Center

Giuseppe Scarcella, *Associate Clinical Professor of Psychiatry and Behavio Sciences*
M.D. 1947, University of Bologna, Italy

Frank Paul Scazzafavo, *Special Lecturer in Health Care Sciences*

Geraldine Schaeffer, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1954, University of Pennsylvania; M.D. 1958, Medical College of Pennsylvania

Joseph Francis Schanno, *Assistant Clinical Professor of Surgery*
B.S. 1945, M.D. 1954, Georgetown University; M.S. 1950, Fordham University

David Edward Scharff, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1962, Yale University; M.D. 1966, Harvard University

Jerrold Francis Schaumleffel, *Special Lecturer in Pathology*

Alan Neil Schechter, *Professorial Lecturer in Biochemistry*
B.A. 1959, Cornell University; M.D. 1963, Columbia University

Geraldine Poppa Schechter, *Associate Professor of Medicine*
B.A. 1959, Vassar College; M.D. 1963, Columbia University

Heinz Hanns Eduard Scheidemandel, *Clinical Instructor in Otolaryngology*
M.D. 1955, University of Erlangen, Germany

Richard Francis Schillaci, *Assistant Clinical Professor of Health Care Sciences*
A.B. 1957, Johns Hopkins University; M.D. 1961, University of Maryland

Paul Schlein, *Associate Clinical Professor of Medicine*
B.A. 1952, M.D. 1956, Cornell University

Steven Allan Schlosser, *Clinical Instructor in Obstetrics and Gynecology*
B.A. 1971, Lafayette College; M.D. 1975, Georgetown University

Thomas Edward Schmitt, *Special Lecturer in Obstetrics and Gynecology*
B.S. 1968, University of Dayton; M.D. 1972, Ohio State University

Marvin Schneider, *Assistant Clinical Professor of Medicine*
B.S. 1956, George Washington University; M.D. 1960, Howard University

Charles Isaac Schneiderman, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1964, University of Michigan; M.D. 1968, George Washington University

Richard Schoenfeld, *Assistant Clinical Professor of Medicine; Associate University Physician*
B.S. 1954, University of Wisconsin; M.D. 1958, State University of New York Upstate Medical Center

James Anthony Schoettler, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1953, California State University, Fresno; M.D. 1957, Johns Hopkins University

George Jerome Schonholtz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1950, New York University; M.D. 1954, State University of New York Downstate Medical Center

Simeon Baruch Schreiber, *Assistant Clinical Professor of Otolaryngology*
B.A. 1969, M.D. 1973, Yeshiva University

Deane E. Schubert, *Lecturer in Pathology*
B.S. 1964, University of Florida; M.S. 1973, Ohio State University

Marianne Schuelein, *Special Lecturer in Child Health and Development*
B.A. 1955, Wellesley College; M.D. 1959, New York University

Carol Ann Brimberg Schulman, *Assistant Clinical Professor of Child Health and Development*
B.A. 1966, Radcliffe College; M.D. 1970, Georgetown University

Cyril Augustus Schulman, *Associate Clinical Professor of Medicine*
B.S. 1938, M.D. 1942, George Washington University

Joseph Daniel Schulman, *Professor of Obstetrics and Gynecology*
B.A. 1961, City University of New York, Brooklyn College; M.D. 1966, Harvard Univers

Richard Scott Schulof, *Assistant Professor of Medicine and of Biochemistr*
B.A. 1968, Cornell University; M.D., Ph.D. 1975, Yeshiva University

Morris Aaron Schultz, *Assistant Clinical Professor of Orthopaedic Surgery*
B.A. 1955, Rice University; M.D. 1959, University of Texas Medical Branch at Galveston

Thomas Aaron Schultz, *Assistant Clinical Professor of Health Care Science*
Ph.B. 1967, B.S. 1969, University of North Dakota; M.D. 1971, Wake Forest University

Harold Robert Schumacher, *Associate Professorial Lecturer in Pathology*
B.S. 1951, M.D. 1955, University of Cincinnati

Harry Arie Schumann, *Clinical Instructor in Medicine*
B.A. 1971, Northwestern University; M.D. 1975, Medical College of Wisconsin

Maxine Ann Schurter, *Associate Clinical Professor of Surgery*
B.A. 1944, Pomona College; M.D. 1951, George Washington University

Glenn Warren Schwarcz, *Assistant Clinical Professor of Psychiatry and B*
havioral Sciences
M.D. 1974, Georgetown University

David Taylor Schwartz, *Assistant Clinical Professor of Urology*
B.A. 1959, Harvard University; M.D. 1963, Columbia University

Don Elliot Schwartz, *Assistant Clinical Professor of Ophthalmology*
B.S. 1963, City University of New York, Queens College; M.D. 1967, Yeshiva University

Frederick Tovi Schwartz, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1965, American International College; M.D. 1969, George Washington University

Marilyn Miller Schwartz, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.S. 1968, M.A. 1972, Ph.D. 1974, University of Maryland

Richard Harvey Schwartz, *Assistant Clinical Professor of Child Health and Development*
B.A. 1960, George Washington University; M.D. 1965, Georgetown University

Stanley Alvin Schwartz, *Assistant Clinical Professor of Medicine*
B.S. 1955, Alfred University; M.D. 1959, Albany Medical College of Union University

Charles Schwarzbeck, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1967, Kenyon College; Ed.M. 1970, Boston University; Ph.D. 1976, University of Texas

Noel Asher Schweig, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1951, Wesleyan University; M.D. 1956, Duke University

Agnes Eva Schweitzer, *Assistant Clinical Professor of Child Health and Development*
B.S. 1955, M.D., C.M. 1959, McGill University

Lewis Pennington Scott III, *Professor of Child Health and Development*
M.D. 1954, Thomas Jefferson University

Richard Nathaniel Scott, *Special Lecturer in Surgery*
B.A. 1963, Lincoln University; M.D. 1967, Howard University

Samuel J. Scott, Jr., *Assistant Professor of Medicine*
B.S. 1966, M.D. 1970, George Washington University

Thomas Walter Scott, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1969, M.D. 1975, George Washington University

Winfield Harker Scott, *Associate Professor of Medicine and of Psychiatry and Behavioral Sciences; Associate Dean of the Medical Center, for Education; Director of the Office of Education*
B.S. 1954, M.S. 1955, Ph.D. 1958, Pennsylvania State University

Joan Rice Sealy, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, University of Chicago; M.D. 1968, George Washington University

Amiel Segal, *Assistant Clinical Professor of Medicine (Hematology-Oncology)*
B.A. 1962, Harvard University; M.D. 1966, University of Pennsylvania

Stuart Floyd Seides, *Associate Clinical Professor of Medicine*
B.S. 1967, Pennsylvania State University; M.D. 1970, Cornell University

Ira Seiler, *Special Lecturer in Child Health and Development*
M.D. 1956, State University of New York Downstate Medical Center

David Murray Seitzman, *Assistant Clinical Professor of Urology*
B.A. 1951, M.D. 1954, Vanderbilt University

Paul Marvin Selfon, *Assistant Clinical Professor of Medicine*
B.S. 1950, Pennsylvania State University; M.D. 1955, Thomas Jefferson University

Mark Harris Selikson, *Adjunct Assistant Professor of Radiology*
B.S. 1971, University of Rochester; Ph.D. 1978, Washington University

Alvin Seltzer, *Associate Clinical Professor of Medicine*
B.S. 1937, M.D. 1941, University of Illinois

Hrant Samuel Semerjian, *Associate Clinical Professor of Urology*
B.S. 1962, M.D. 1965, American University of Beirut

John Louis Sever, *Professorial Lecturer in Child Health and Development and in Obstetrics and Gynecology*
M.D., Ph.D. 1957, Northwestern University

Matthew Lincoln Severns, *Assistant Professor of Clinical Engineering*
B.A. 1976, University of Delaware; M.E. 1978, Ph.D. 1980, University of Virginia

John Christopher Seymour, *Assistant Clinical Professor of Medicine*
B.A. 1961, Brown University; M.D. 1965, George Washington University

Carolyn S. Shaffer, *Assistant Professor of Health Care Sciences and of Psychiatry and Behavioral Sciences*
B.S. 1968, Pennsylvania State University; M.Ed. 1972, Ph.D. 1976, University of Virginia

Michael John Shaffer, *Associate Professor of Anesthesiology*
B.S. in E.E. 1949, University of Leeds; M.S. 1974, D.Sc. 1981, George Washington University

Parvez Ilyas Shah, *Clinical Instructor in Urology*
M.B., B.S. 1960, Dow Medical College, Pakistan

Mohammad B. G. Shahvari, *Associate Professor of Anesthesiology*
M.D. 1968, Pahlavi University, Iran; M.S. 1973, Temple University

Sheila Ann Shanahan, *Clinical Instructor in Child Health and Development*
B.A. 1963, Trinity College, District of Columbia; M.D. 1969, Medical College of Pennsylvania

Jay Robert Shapiro, *Associate Clinical Professor of Medicine*
B.S. 1953, Franklin and Marshall College; M.D. 1957, Boston University

Joan R. Shapiro, *Assistant Professor of Health Care Sciences and of Psychiatry and Behavioral Sciences*
B.A. 1971, University of Wisconsin; M.A. 1973, Ph.D. 1975, University of Connecticut

Philip Shapiro, *Assistant Research Professor of Radiology*
B.S. 1948, City University of New York, Brooklyn College; Ph.D. 1953, State University of Iowa

Roger Lee Shapiro, *Clinical Professor of Psychiatry and Behavioral Scienc*
B.S. 1947, M.D. 1949, University of Chicago

Stephen Robert Shapiro, *Associate Professor of Child Health and Develop*
B.S. 1963, Tufts University; M.D. 1967, New York University

David James Sharpe, *Professor of Law and of Medical and Public Affairs*
B.A. 1950, University of North Carolina; LL.B. 1955, S.J.D. 1969, Harvard University

Alan Bruce Shauer, *Assistant Clinical Professor of Medicine*
B.A. 1963, New York University; M.D. 1968, University of Bologna

Benjamin Alfonza Shaver, *Assistant Clinical Professor of Child Health Development*
B.S. 1952, Massachusetts Institute of Technology; M.D. 1956, Yale University

Samuel Hazen Shea, *Assistant Clinical Professor of Obstetrics and Gynecol*
B.A. 1933, M.D. 1936, George Washington University

Robert Shearin, *Special Lecturer in Child Health and Development*
B.S. 1964, North Carolina State University at Raleigh; M.D. 1968, University of North C lina

Michael Mendel Shefferman, *Assistant Clinical Professor of Medicine*
B.A. 1958, Johns Hopkins University; M.D. 1962, University of Maryland

Joseph Bart Sheffery, *Professorial Lecturer in Obstetrics and Gynecology*
M.D. 1937, Georgetown University

Samuel Ainslie Shelburne, Jr., *Professor of Neurology and of Child Health Development*
B.A. 1956, Princeton University; M.D. 1960, University of Texas, Southwestern Medical Sch at Dallas

Peter Bruce Sherer, *Assistant Clinical Professor of Medicine*
B.S. 1972, Rensselaer Polytechnic Institute; M.D. 1972, Albany Medical College of Un University

Joseph Lee Sheridan, *Associate Clinical Professor of Psychiatry and Behavior Sciences*
B.A. 1939, Indiana University at Bloomington; M.D. 1943, Indiana University at Indianapo

Barbara Ensfield Sherwin, *Assistant Clinical Professor of Medicine*
B.S. 1959, Antioch College; M.D. 1967, George Washington University

Robert F. Shesser, *Assistant Professor of Health Care Sciences (Emergency Medicine) and of Medicine*
B.A. 1971, University of Rochester; M.D. 1976, University of Miami

Valerie Eleanor Shipilov, *Special Lecturer in Pathology*
B.S. 1973, University of California, Davis; B.S. 1975, San Jose State University

Paul Edgar Shorb, Jr., *Professor of Surgery*
B.A. 1951, Williams College; M.D. 1955, Johns Hopkins University

Milton F. Shore, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1949, Harvard University; M.A. 1950, Ph.D. 1955, Boston University

Billie Lou Short, *Assistant Professor of Child Health and Development*
B.S. 1969, Northwestern Oklahoma State University; M.D. 1974, University of Oklahoma

George Michael Shumaik, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1973, M.D. 1974, University of Colorado

Charles Jerome Shuman, *Adjunct Assistant Professor of Medicine*
B.S. 1969, University of Maryland; M.A. 1970, Catholic University of America; D.P.M. 19 Pennsylvania College of Podiatric Medicine

Irwin Shuman, *Assistant Clinical Professor of Urology*
B.S. 1955, George Washington University; M.D. 1959, Georgetown University

James Buren Sidbury, Jr., *Professor of Child Health and Development*
B.S. 1944, Yale University; M.D. 1947, Columbia University

Vickie Sidou, *Assistant Professor of Anesthesiology*
B.A. 1972, University of Rochester; M.D. 1976, State University of New York Health Science Center at Buffalo

Herschel Sidransky, *Professor of Pathology; Chairman of the Department of Pathology*
B.S. 1948, M.D. 1953, M.S. 1958, Tulane University

Robert Stanley Siegel, *Clinical Instructor in Surgery (Oral Surgery)*
B.S. 1958, D.D.S. 1961, University of Maryland

Rubin Louis Siegel, *Special Lecturer in Psychiatry and Behavioral Sciences*
B.S. 1930, City University of New York, City College; M.D. 1936, Royal Colleges, Scotland

Tomas Jose Silber, *Associate Professor of Child Health and Development*
B.A. 1959, Colegio Acassuso; M.D. 1966, University of Buenos Aires; M.A. in Sp.Std. 1979, George Washington University

Howard M. Silby, *Assistant Clinical Professor of Neurology*
B.A. 1957, Dartmouth College; M.D. 1962, State University of New York at Buffalo

Carlos Alberto Silva, *Associate Clinical Professor of Surgery*
B.S. 1956, University of Puerto Rico; M.D. 1960, George Washington University

Omega Cecile Logan Silva, *Associate Professor of Medicine*
B.S. 1958, M.D. 1967, Howard University

Harold Martin Silver, *Clinical Professor of Medicine*
B.A. 1946, M.D. 1949, Columbia University

Sylvia Silver, *Assistant Professor of Medical Technology in Pathology*
B.A. 1965, Drake University; M.T.S. 1975, D.A. 1977, Catholic University of America

Mary Rottschaefer Silverman, *Adjunct Assistant Professor of Health Care Sciences*
B.S.N. 1965, M.P.H. 1970, University of Michigan

David Bart Simon, *Associate Clinical Professor of Medicine*
M.D. 1967, George Washington University

Ernest Robert Simon, *Professor of Medicine*
M.D. 1954, Harvard University

Gary Leonard Simon, *Assistant Professor of Medicine*
B.S. 1968, University of Maryland; M.S. 1970, Ph.D. 1972, University of Wisconsin; M.D. 1975, University of Maryland

Kenneth Alan Simon, *Assistant Clinical Professor of Ophthalmology*
B.A. 1952, University of Pennsylvania; M.S. 1955, M.D. 1957, Yale University

Kermit Oscar Simrel, *Assistant Clinical Professor of Child Health and Development*
B.S. 1970, Howard University; M.D. 1974, Duke University

Thomas Gordon Sinderson, *Assistant Clinical Professor of Medicine*
B.A. 1965, Emory University; M.D. 1969, George Washington University

Maurice Arthur Sislen, *Assistant Clinical Professor of Medicine*
B.A. 1944, M.D. 1947, George Washington University

James Glover Sites, *Professor of Obstetrics and Gynecology*
M.D. 1947, George Washington University

John Chauncey Skilling, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1955, Princeton University; M.D. 1961, Hahnemann Medical College

Shirley Weiss Skoler, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1951, New York University; M.S.W. 1969, Howard University

Marvin Ralph Skolnick, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Emory University; M.D. 1963, Yale University

Frank James Slaby, *Associate Professor of Anatomy*
B.S. 1965, California Institute of Technology; Ph.D. 1971, University of California, Berk

Barton Kent Slemmons, *Associate Professor of Orthopaedic Surgery*
B.A. 1952, University of North Dakota; M.D. 1954, University of Illinois

Ridge Michael Sly, *Professor of Child Health and Development*
B.A. 1956, Kenyon College; M.D. 1960, Washington University

Allen Small, *Assistant Clinical Professor of Otolaryngology*
B.A. 1962, Columbia University; M.D. 1966, State University of New York Downstate Me Center

Barry Hamilton Smith, *Assistant Clinical Professor of Neurological Surgery*
B.A. 1965, Harvard University; Ph.D. 1968, Massachusetts Institute of Technology; M.D. Cornell University

Benjamin Williams Smith, *Professor of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, Co Washington University

Bruce Hamilton Smith, *Professor of Pathology*
B.A. 1940, M.D. 1943, Syracuse University

Howard Neil Smith, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1967, St. Peter's College; M.D. 1971, George Washington University

James Cecil Smith, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1956, M.S. 1959, Ph.D. 1964, University of Maryland

James Joseph Smith, *Clinical Professor of Radiology (Nuclear Medicine)*
B.A. 1932, Catholic University of America; M.D. 1940, Yale University

Joseph H. Smith, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1947, M.D. 1952, University of Virginia

Lamar Richard Smith, *Special Lecturer in Health Care Sciences*
B.S. in Phar. 1957, University of Texas; M.S. in Phar. 1971, University of Arizona

Lee Elton Smith, *Assistant Professor of Surgery*
B.A. 1959, University of California, Berkeley; M.D. 1962, University of California, San Francisco

Mark Stephen Smith, *Instructor in Health Care Sciences (Emergency Medicine) and of Medicine*
B.A. 1968, Swarthmore College; M.S. 1971, Stanford University; M.D. 1977, Yale University

Robert Benjamin Warfield Smith, *Associate Clinical Professor of Medicine*
M.D. 1949, Columbia University

Bruce Melvyn Smoller, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1965, Cornell University; M.D. 1969, Tulane University

Nicholas Patrick Dillon Smyth, *Associate Clinical Professor of Surgery*
M.S. 1948, M.B., Ch.B. 1949, University College, Dublin; M.S. 1954, University of Michigan

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery; Chairman of the Department of Anatomy*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London

Joseph Snyder, *Assistant Clinical Professor of Ophthalmology*
B.A. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

Edgar Henry Soifer, *Assistant Clinical Professor of Urology*
B.A. 1953, Washington and Jefferson College; M.D. 1957, New York University

Jose Tomas Solano, *Assistant Clinical Professor of Medicine*
B.S. 1951, Colegio San Bartolome; M.D. 1957, Javeriana University, Colombia

Nader Edward Soliman, *Assistant Professor of Anesthesiology*
M.B., Ch.B. 1967, D.A. 1970, Assiut University, Egypt

Steven Louis Solomon, *Assistant Clinical Professor of Medicine*
B.A. 1971, Rutgers—The State University; M.D. 1975, Tufts University

Eliot Sorel, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1966, New York University; M.D. 1971, State University of New York

Lawrence Fredric Sorkin, *Assistant Professor of Child Health and Development and of Medicine*
B.A. 1969, Colgate University; M.D. 1974, University of Health Sciences/Chicago Medical School

Eleanor Attianese Sorrentino, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, Bryn Mawr College; M.D. 1962, Harvard University

Stuart M. Sotsky, *Assistant Professor of Psychiatry and Behavioral Sciences*
B.A. 1968, M.D. 1971, M.P.H. 1971, Johns Hopkins University

Gary Jan Soverow, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
A.B. 1968, Princeton University; M.D. 1972, Harvard University

Peter Soyster, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1948, George Washington University

Samuel Vincent Spagnolo, *Associate Professor of Medicine*
B.A. 1961, Washington and Jefferson College; M.D. 1965, Temple University

George Speck, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1937, University of Michigan; M.D. 1941, George Washington University

Israel Spector, *Assistant Clinical Professor of Medicine*
B.S. 1958, City University of New York, Brooklyn College; M.D. 1962, University of Health Sciences/Chicago Medical School

Ian James Spence, *Assistant Clinical Professor of Urology*
B.S. 1955, Union College, New York; M.D. 1959, Albany Medical College of Union University

Chariklia Tziraki Spiegel, *Assistant Professor of Medicine and of Health Care Sciences*
B.A. 1969, University of California, Berkeley; M.D. 1973, University of California, San Francisco

Paul Stephen Spiegler, *Clinical Instructor in Medicine*
B.A. 1960, New York University; M.D. 1969, George Washington University

Kenneth Robert Spring, *Associate Professorial Lecturer in Physiology*
D.M.D. 1966, Tufts University; Ph.D. 1971, State University of New York at Buffalo

Jeanne Spurlock, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1947, Howard University

Raymond L. Standard, *Associate Clinical Professor of Medicine*
B.S. 1948, M.D. 1952, Howard University; M.P.H. 1967, Johns Hopkins University

Gary Scott Staples, *Assistant Clinical Professor of Radiology*
B.S. 1962, Baldwin-Wallace College; M.D. 1966, Ohio State University

William Stark, *Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1939, New York University; M.D. 1943, University of Louisville

Henry Joseph Starr, *Clinical Instructor in Ophthalmology*
B.A. 1955, Bowdoin College; M.D. 1959, Johns Hopkins University

Samuel McDowell Steele, Jr., *Assistant Clinical Professor of Health Sciences*
B.S. 1961, M.S. 1962, Kansas State College of Pittsburg; M.D. 1968, University of Kansas

Ruth Lebo Steerman, *Assistant Clinical Professor of Child Health and Development*
M.D. 1967, George Washington University

Edward Steers, Jr., *Professorial Lecturer in Biochemistry*
B.S. 1959, Ph.D. 1963, University of Pennsylvania

Arthur Harold Stein, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1962, Harvard University; M.D. 1966, Cornell University

Harry Calvin Stein, *Clinical Instructor in Otolaryngology*
B.S. 1961, Loyola College; M.D. 1965, University of Maryland

Walter Anthony Stein, *Assistant Professor of Health Care Sciences*
B.S. 1973, State University of New York at Stony Brook

Harvey Steinberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1958, University of Pennsylvania; M.D. 1962, Thomas Jefferson University

Paul J. Steinberg, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1970, University of Pennsylvania; M.D. 1974, State University of New York Downstate Medical Center

William Mark Steinberg, *Assistant Professor of Medicine (Gastroenterology)*
B.A. 1966, Columbia University; M.D. 1970, New York University

Harvey J. Steinfeld, *Assistant Clinical Professor of Health Care Sciences*
M.D. 1965, State University of New York Downstate Medical Center

Peter Joseph Steinglass, *Associate Professor of Psychiatry and Behavioral Sciences and of Health Care Sciences*
B.A. 1960, Union College, New York; M.D. 1965, Harvard University

Melvin Joseph Stern, *Associate Clinical Professor of Medicine and of Psychiatry and Behavioral Sciences*
B.A. 1961, M.D. 1965, Yeshiva University

Robert Glen Stevenson, Jr., *Assistant Clinical Professor of Health Care Sciences*
B.S. 1976, University of Nebraska

Steele Fuller Stewart, Jr., *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1950, Carleton College; M.D. 1959, University of Pennsylvania

James Austin Stickland, *Special Lecturer in Radiology*

Robert Joseph Stillman, *Assistant Professor of Obstetrics and Gynecology*
B.A. 1969, Boston University; M.D. 1973, Georgetown University

Merril Stock, *Assistant Clinical Professor of Medicine*
B.S. 1967, Albright College; M.D. 1971, Thomas Jefferson University

William James Stockton, *Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1956, University of Oklahoma

Gerald Virgil Stokes, *Associate Professor of Microbiology*
B.A. 1967, Southern Illinois University; Ph.D. 1973, University of Chicago

Myer Harold Stolar, *Clinical Professor of Medicine*
B.S. 1936, George Washington University; M.D. 1941, Georgetown University

Samuel Stoleru, *Assistant Clinical Professor of Ophthalmology*
B.S. 1961, Colegio Hebreo Jorge Isaacs, Colombia; M.D. 1968, Universidad del Valle, Colombia

Alan William Stone, *Associate Professor of Health Care Sciences and of Medicine*
B.A. 1961, Harvard University; M.D. 1966, Yale University

Bernard Stopak, *Clinical Instructor in Neurological Surgery*
B.S. 1959, University of Maryland; M.D. 1970, Universite de Montpellier, France

Belinda Crompton Straight, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
M.D. 1952, New York University

Robert Edward Strange, *Adjunct Professor of Psychiatry and Behavioral Sciences*
M.D. 1957, Indiana University

Fred Strassburger, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1954, University of Colorado; Ph.D. 1963, Stanford University

James Ashley Straw, *Professor of Pharmacology; Director of Laboratory Animal Services, Medical Center*
B.S. 1958, Ph.D. 1963, University of Florida

Franklin Lyle Stroud, *Clinical Instructor in Child Health and Development*
B.S. 1961, M.D. 1965, University of Illinois

Donald Lee Sturtz, *Assistant Professor of Surgery*
B.S. 1955, U.S. Naval Academy; M.D. 1965, University of Pennsylvania

Samuel Jacob Nathan Sugar, *Associate Clinical Professor of Health Care Sciences*
Phar.G. 1931, M.D. 1938, George Washington University

Lucian Octav Sulica, *Assistant Clinical Professor of Medicine*
M.D. 1957, CLUJ School of Medicine, Romania

Thomas J. Sullivan, *Associate Clinical Professor of Child Health and Development*
B.A. 1960, M.D. 1964, Seton Hall University

James Knox Summitt, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1960, Harding College; M.D. 1963, University of Tennessee Center for the Health Sciences

Roberto Navarro Sunga, *Assistant Clinical Professor of Ophthalmology*
M.D. 1958, University of the Philippines

Amin Mohammed Suria, *Associate Professor of Pharmacology*
B.S. 1963, M.S. 1964, University of Karachi, Pakistan; Ph.D. 1971, Vanderbilt University

Louise Elaine Swanberg, *Assistant Professor of Medicine*
B.A. 1971, University of Colorado; M.D. 1976, Creighton University

Ellis Mason Taft, *Assistant Professorial Lecturer in Health Care Sciences*

Stanley Jerome Talpers, *Associate Clinical Professor of Medicine*
B.A. 1948, M.D. 1953, University of Colorado

John Alexis Lam Sang Tam, *Associate Professor of Anesthesiology and of Child Health and Development*
M.B., B.S. 1967, University of Hong Kong

Irene Gorski Tamagna, *Professor of Medicine*
M.D. 1943, Medical College of Pennsylvania

Annop Tantisunthorn, *Assistant Clinical Professor of Child Health and D velopment*
M.D. 1966, Tokyo Medical and Dental University

Hazel McGee Tape, *Assistant Professor of Health Care Sciences*
B.S. 1966, Tougaloo College; M.A. 1968, Johns Hopkins University; M.D. 1977, Universit Maryland

Nelson Monroe Tart, *Associate Clinical Professor of Obstetrics and Gynecol*
B.S. 1949, Wake Forest University; M.D. 1955, George Washington University

Joel M. Taubin, *Assistant Clinical Professor of Medicine*
B.A. 1963, M.A. 1965, George Washington University; M.D. 1969, University of Virginia

Edith S. Taylor, *Assistant Clinical Professor of Psychiatry and Behavioral S ences and of Child Health and Development*
B.S. 1945, Radcliffe College; M.D. 1949, Harvard University

Raquel S. Teitel, *Assistant Clinical Professor of Psychiatry and Behavio Sciences*
B.A. 1957, Instituto Nacional del Profesorado; M.A. 1965, City University of New York, C College; Ph.D. 1973, American University

Terry Alan Teplitz, *Clinical Instructor in Psychiatry and Behavioral Sciences*
A.B. 1971, Washington University; M.D. 1975, University of Maryland, Baltimore

Bernard Scott Teunis, *Assistant Clinical Professor of Surgery (Plastic Surge*
B.A. 1958, M.D. 1962, University of Virginia

Paul Francis Teychenne, *Associate Professor of Neurology and of Pharmac ogy*
M.B., B.S. 1968, University of Sydney

James Richard Thistlethwaite, *Clinical Professor of Surgery*
B.S. 1943, University of Richmond; M.D. 1947, Duke University

Greg Paul Thomas, *Assistant Professor of Health Care Sciences; Assistant D rector of the Office of Continuing Education*
B.S. 1975, Xavier University; B.S. 1977, Baylor University; M.P.H. 1978, University of Tex Health Science Center at Houston

Kenneth Leroy Thomas, *Special Lecturer in Health Care Sciences*

Lawrence Jay Thomas, *Associate Clinical Professor of Medicine*
B.S. 1934, New York University; M.D. 1938, George Washington University

Martin Alfred Thomas, *Assistant Clinical Professor of Radiology*
B.S. 1948, Purdue University; M.D. 1952, Indiana University at Indianapolis

Anne Marie Salmon Thompson, *Associate Professor of Medicine*
B.A. 1963, Immaculata College; M.D. 1967, Thomas Jefferson University

Charles Waters Thompson, *Clinical Professor of Medicine*
M.D. 1941, George Washington University

David Herron Thompson, *Special Lecturer in Health Care Sciences*
B.S. 1968, University of Miami; M.D. 1972, Ohio State University

Earle Brosius Thompson, *Assistant Clinical Professor of Medicine*
B.S. 1945, Franklin and Marshall College; M.D. 1945, University of Pennsylvania

Lewis William Thompson, *Associate Professor of Surgery and of Child Healt and Development*
B.A. 1955, Asbury College; M.D. 1960, Wake Forest University

William Frederic Thompson, *Assistant Clinical Professor of Psychiatry an Behavioral Sciences*
B.S. 1963, City University of New York, City College; M.D. 1967, George Washington Univer sity

George John Thorpe, *Assistant Clinical Professor of Medicine*
B.A. 1956, M.D. 1960, Case Western Reserve University

Marvin Tyrone Threatt, *Special Lecturer in Health Care Sciences*

Gary Boyd Thurman, *Associate Research Professor of Biochemistry*
B.S. 1966, Brigham Young University; Ph.D. 1970, University of Utah

Gertrude Ruth Ticho, *Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1944, University of Vienna

Charles Stanley Tidball, *Henry D. Fry Professor of Physiology*
B.A. 1950, Wesleyan University; M.S. 1952, University of Rochester; Ph.D. 1955, University of Wisconsin; M.D. 1958, University of Chicago

Mary Elizabeth Tidball, *Professor of Physiology*
B.A. 1951, Mount Holyoke College; M.S. 1955, Ph.D. 1959, University of Wisconsin; Sc.D. 1973, Wilson College; D.Sc. 1974, Trinity College, District of Columbia; L.H.D. 1976, Mount Holyoke College; HH.D. 1977, Saint Mary's College, Indiana; D.Sc. 1977, Cedar Crest College; D.Sc. 1978, The University of the South; D.Sc. 1979, Goucher College; Litt.D. 1980, Regis College

Andrew Leon Tievsky, *Assistant Clinical Professor of Radiology*
B.A. 1970, University of Rochester; M.D. 1974, George Washington University

George Tievsky, *Assistant Clinical Professor of Radiology*
B.S. in Phar. 1939, M.D. 1943, George Washington University

Donn Lloyd Tippett, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1947, Ohio State University

Evadne Marjorie Titer, *Clinical Instructor in Ophthalmology*
B.S. 1963, M.D. 1967, Howard University

Charles Cameron Titus, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1955, Oberlin College; M.D. 1960, Case Western Reserve University

Elijah White Titus, Jr., *Clinical Professor of Obstetrics and Gynecology*
M.D. 1952, George Washington University

Jane Wendy Lehu Todaro, *Associate Professor of Child Health and Development*
B.A. 1960, Vassar College; M.D. 1965, New York University

Mark David Tolpin, *Research Instructor in Child Health and Development*
B.A. 1970, M.D. 1974, University of Chicago

Xenia Tonesk, *Clinical Instructor in Psychiatry and Behavioral Sciences*
B.A. 1969, M.A. 1977, Ph.D. 1977, Catholic University of America

Charles Eby Townsend, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, M.D. 1951, George Washington University

Lee William Treadwell, Jr., *Adjunct Instructor in Radiology*

Howard Pettit Treichler, *Associate Clinical Professor of Obstetrics and Gynecology*
M.D. 1946, George Washington University

William MacLohon Trible, *Clinical Professor of Otolaryngology*
B.A. 1943, Princeton University; M.D. 1950, George Washington University; M.S. in Med. 1956, University of Pennsylvania

Gordon Anderson Tripp, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.A. 1957, Harvard University; M.D. 1961, Duke University

Hugh Henry Trout III, *Assistant Professor of Surgery*
B.S. 1963, Washington and Lee University; M.D. 1967, Duke University

Janett Rosenberg Trubatch, *Associate Research Professor of Physiology*
B.S. 1962, Ph.D. 1968, Polytechnic Institute of New York; M.A. 1964, Brandeis University

Nelson Perez Trujillo, *Clinical Professor of Medicine*
B.S. 1955, Baldor Academy, Cuba; M.D. 1962, Tulane University

Bernard Tsai, *Assistant Professor of Anesthesiology and of Child Health a*
Development
M.D. 1970, Taipei Medical College

Neofytos Theodore Tsangaris, *Professor of Surgery*
B.S. 1952, Duke University; M.D. 1956, George Washington University

Carmelita Uichanco Tuazon, *Associate Professor of Medicine*
B.S. 1963, M.D. 1967, University of the Philippines

Ira Nathan Tublin, *Associate Clinical Professor of Medicine*
B.S. 1950, M.D. 1954, University of Maryland

Lester Turner, *Assistant Clinical Professor of Psychiatry and Behavioral Sc*
ences (Psychology)
B.A. 1958, M.A. 1960, Ph.D. 1967, University of Texas

Maria Lourdes Turner, *Associate Professor of Dermatology*
B.S. 1958, M.D. 1961, University of the Philippines

Raymond William Turner, *Assistant Clinical Professor of Medicine*
B.A. 1954, Amherst College; M.D. 1958, Yale University

David E. Uddin, *Assistant Professorial Lecturer in Pathology*
B.S. 1963, Drake University; Ph.D. 1967, University of Illinois

Arthur Richard Ugel, *Associate Clinical Professor of Dermatology and of Ch*
Health and Development
B.S. 1961, M.D. 1965, George Washington University

Marion Lazar Usher, *Assistant Clinical Professor of Psychiatry and Behavior*
Sciences
B.A. 1962, McGill University; M.S. in S.W. 1965, University of Wisconsin

George Vartkes Vahouny, *Professor of Biochemistry*
B.S. 1953, M.S. 1955, Ph.D. 1958, George Washington University

Martin John Valaske, *Professor of Pathology; Medical Director, Medical Fa*
ulty Associates
Ph.B. 1950, M.D. 1954, Marquette University

John David Van Brakle, *Assistant Professor of Child Health and Developme*
B.S. 1970, Muhlenberg College; M.D. 1974, George Washington University

Robert James Van Houten, *Professor of Anesthesiology; Associate Dean of th*
Medical Center, for Graduate Medical Education
B.S. 1950, Albright College; M.D. 1954, Hahnemann Medical College

Anna Maria Louize Van Rooy, *Assistant Clinical Professor of Obstetrics an*
Gynecology
M.D. 1953, University of Utrecht, The Netherlands

Mary Ann Vander Maten, *Assistant Research Professor of Biochemistry*
B.A. 1971, Northwestern College, Iowa; Ph.D. 1975, University of Kansas

Joseph Aaron Vander Walde, *Clinical Instructor in Child Health and Develop*
ment
B.S. 1971, University of Wisconsin; M.D. 1975, University of Pennsylvania

Jack Yehudi Vanderhoek, *Assistant Research Professor of Biochemistry*
B.S. 1960, City University of New York, City College; Ph.D. 1966, Massachusetts Institute of Technology

Palathinkal Jacob Varghese, *Associate Professor of Medicine and of Child Health and Development*
M.B., B.S. 1958, Kerala University, India; M.R.C.P. 1962, Royal College of Physicians, Edinburgh; M.R.C.P. 1963, Royal College of Physicians, London

Vijay Mohan Varma, *Professor of Radiology*
M.B., B.S. 1958, Osmania University; M.D. 1963, All India Institute of Medical Sciences

Marc Vatin, *Clinical Instructor in Obstetrics and Gynecology*
M.D. 1971, University of Marseille; M.P.H. 1979, University of North Carolina

Brantley Paul Vitek, *Associate Clinical Professor of Orthopaedic Surgery*
B.A. 1957, Western Maryland College; M.D. 1961, University of Maryland

Lawrence Anthony Vitulano, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
B.S. 1972, Georgetown University; Ph.D. 1977, Catholic University of America

Hilda Tawil Vollero, *Clinical Instructor in Neurology and in Child Health and Development*
B.S. 1961, M.D. 1966, American University of Beirut

Ralph Weyman Wadeson, Jr., *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
M.D. 1947, University of Alabama in Birmingham

Gerald Eugene Wagner, *Assistant Professor of Microbiology*
B.S. 1972, Emory and Henry College; M.S. 1975, Ph.D. 1977, Medical College of Virginia of Virginia Commonwealth University

Martha Jane Wagner, *Assistant Professor of Health Care Sciences and of Child Health and Development*
B.A. 1964, DePauw University; M.D. 1967, University of Louisville; M.P.H. 1978, Johns Hopkins University

Chester Leeroy Wagstaff, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1944, University of Richmond; M.D. 1951, University of Pennsylvania

Harold J. Wain, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1964, City University of New York, Brooklyn College; M.A. 1966, Columbia University; Ph.D. 1970, University of Nebraska

Robert Stephen Waldman, *Clinical Instructor in Medicine*
B.A. 1957, University of Pennsylvania; M.D. 1961, Georgetown University

Jeremy Peter Waletzky, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1964, Yale University; M.D. 1968, Columbia University

Glenn Anthony Walker, *Associate Professor of Biochemistry*
B.A. 1958, Bellarmine College; Ph.D. 1963, Michigan State University

William Davies Wallace, Jr., *Assistant Clinical Professor of Obstetrics and Gynecology*
B.S. 1949, Westminster College, Pennsylvania; M.D. 1953, Thomas Jefferson University

James Christopher Walsh, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1941, M.D. 1945, Georgetown University

John Alan Walsh, *Clinical Instructor in Surgery*
B.S. 1970, Villanova University; M.D. 1975, Albany Medical College of Union University

John Walter Walsh, *Associate Clinical Professor of Medicine*
B.S. 1938, St. Francis College, New York; M.D. 1942, State University of New York D
state Medical Center

Raymond John Walsh, *Assistant Professor of Anatomy*
B.S. 1969, University of Massachusetts; Ph.D. 1978, Tufts University

Thomas Emmett Walsh, *Assistant Clinical Professor of Health Care Science*
A.B. 1965, M.D. 1969, Georgetown University

David Murray Wanicur, *Assistant Clinical Professor of Ophthalmology*
B.A. 1961, University of Pennsylvania; M.D. 1965, University of Pittsburgh

Richard James Warchol, *Assistant Professor of Medicine*
B.A. 1967, Millikin University; M.D. 1972, George Washington University

Archibald Ward, Jr., *Associate Clinical Professor of Psychiatry and Behavior*
Sciences (Sociology)
B.S. 1933, North Carolina State University at Raleigh; B.D. 1937, Crozer Theological Semin
Ph.D. 1947, University of Maryland

Robert Edward Ware, *Assistant Clinical Professor of Urology*
M.D. 1953, Medical College of Virginia of Virginia Commonwealth University

William Joseph Washington, Jr., *Associate Clinical Professor of Health Co*
Sciences
B.A. 1944, Talladega College; M.D. 1947, Howard University

Alan Gary Wasserman, *Assistant Professor of Medicine*
B.A. 1969, Rutgers—The State University; M.D. 1973, Hahnemann Medical College

Daniel Hough Waterman, *Assistant Clinical Professor of Medicine*
B.S. 1966, Trinity College, Connecticut; M.D. 1973, Hahnemann Medical College

Elzberry Waters, Jr., *Research Professor of Medical and Public Affairs*
B.A. 1963, M.A. 1966, George Washington University; Ph.D. 1973, American University

Donald Morgan Watkin, *Associate Research Professor of Medicine*
A.B. 1943, Hamilton College; M.D. 1946, M.P.H. 1965, Harvard University

Don Wayne Watkins, *Associate Professor of Physiology*
B.Ch.E. 1963, University of Louisville; Ph.D. 1968, University of Wisconsin

Benny Waxman, *Professor of Obstetrics and Gynecology*
M.D. 1957, University of Western Ontario

Kenneth Earl Weaver, *Assistant Professor of Radiology*
B.S. 1964, California State University, Los Angeles; M.S. 1968, Oregon State University

Blair McWhorter Webb, *Clinical Professor of Otolaryngology and of Ch*
Health and Development
B.S. 1951, Hampden-Sydney College; M.D. 1955, University of Virginia

Thomas Glenn Webster, *Professor of Psychiatry and Behavioral Sciences*
B.A. 1946, Fort Hays Kansas State College; M.D. 1949, Wayne State University

William Dean Wehunt, *Assistant Clinical Professor of Radiology*
B.S. 1968, Mercer University; M.D. 1972, Vanderbilt University

William Joseph Weiler, *Adjunct Instructor in Radiology*

Lawrence Mark Weinberg, *Clinical Instructor in Medicine*
B.A. 1972, Wesleyan University; M.D. 1976, Boston University

Daniel Roy Weinberger, *Assistant Clinical Professor of Psychiatry and B*
havioral Sciences
B.A. 1969, Johns Hopkins University; M.D. 1973, University of Pennsylvania

Harold Weiner, *Clinical Professor of Psychiatry and Behavioral Sciences (Experimental Psychology)*
B.B.A. 1953, City University of New York, City College; M.A. 1957, Ph.D. 1960, University of Maryland

Jay Harlan Weiner, *Assistant Clinical Professor of Medicine*
B.A. 1971, M.D. 1975, George Washington University

Allan Byrne Weingold, *Professor of Obstetrics and Gynecology; Chairman of the Department of Obstetrics and Gynecology*
B.A. 1951, Oberlin College; M.D. 1955, New York Medical College

Allan Michael Weinstein, *Assistant Clinical Professor of Medicine*
B.A. 1970, Lafayette College; M.D. 1974, University of Kentucky

Jacob Joseph Weinstein, *Clinical Professor of Surgery*
Phar.G. 1930, B.S. 1934, M.D. 1936, University of Maryland

Herbert D. Weintraub, *Professor of Anesthesiology*
B.A. 1950, New York University; M.A. 1958, B.M., B.Ch. 1959, Oxford University

Paul Stephen Weisberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1952, Harvard University; M.D. 1958, Marquette University

Daniel Leigh Weiss, *Clinical Professor of Pathology*
B.A. 1943, M.D. 1946, Columbia University

Harold Weiss, *Associate Clinical Professor of Medicine*
B.A. 1954, New York University; M.D. 1959, University of Health Sciences/Chicago Medical School

Ira Paul Weiss, *Associate Professor of Child Health and Development*
B.S. 1965, City University of New York, City College; Ph.D. 1969, Syracuse University

Lowell Martin Weiss, *Associate Clinical Professor of Medicine*
B.S. 1957, Rutgers—The State University; M.D. 1962, George Washington University

Michael Aron Weiss, *Assistant Clinical Professor of Radiology*
B.A. 1966, University of Rochester; M.D. 1970, New York University

Mark Irwin Weissman, *Assistant Professor of Health Care Sciences and of Child Health and Development*
B.S. 1973, Pennsylvania State University; M.D. 1975, Thomas Jefferson University

Stephen M. Weissman, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1959, Cornell University; M.D. 1963, Yeshiva University

Isaac Weiszer, *Assistant Clinical Professor of Medicine*
B.S. 1956, M.D. 1960, University of Illinois

Leila Greiss Welborn, *Assistant Professor of Anesthesiology and of Child Health and Development*
M.B., Ch.B. 1967, Cairo University

James Lansing Wellhouse, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1948, University of Iowa; M.D. 1952, Washington University

Karen Cameron Wells, *Assistant Professor of Psychiatry and Behavioral Sciences and of Child Health and Development*
A.B. 1974, M.S. 1976, Ph.D. 1978, University of Georgia

Louis Wener, *Clinical Instructor in Radiology*
M.D. 1956, University of Tennessee

Mario Werner, *Professor of Pathology (Laboratory Medicine)*
M.D. 1960, University of Zurich

Stephan Lionel Werner, *Clinical Instructor in Urology*
B.A. 1960, Clark University; M.D. 1960, Yeshiva University

Gloria Ruth Goldsmith Werth, *Associate Professor of Medicine*
B.A. 1949, Goucher College; M.D. 1953, Johns Hopkins University

Jean Kendrick Weston, *Adjunct Professor of Clinical Engineering*
B.A. 1930, M.S. 1931, University of Michigan; Ph.D. 1933, M.D. 1941, Temple University

Edwin Eugene Westura, *Associate Clinical Professor of Radiology and of Medicine*
B.A. 1952, St. Peter's College, New Jersey; M.D. 1957, Creighton University

Linda J. Whitby-Birckhead, *Clinical Instructor in Obstetrics and Gynecology*
B.S. 1970, Pennsylvania State University; M.D. 1974, Howard University

Paul Vernon Whitmore, *Assistant Clinical Professor of Ophthalmology*
B.S. 1962, M.D. 1966, University of Michigan

Eric Heath Whittemore, *Adjunct Instructor in Radiology (Nuclear Medicine Technology)*
B.S. 1978, Southern Illinois University

Henry Sindos Wicker, *Assistant Clinical Professor of Ophthalmology*
B.S. 1948, Xavier University of Louisiana; M.D. 1953, Howard University

Jerry M. Wiener, *Professor of Psychiatry and Behavioral Sciences and of Child Health and Development; Chairman, Department of Psychiatry and Behavioral Sciences*
M.D. 1956, Baylor University

Sam W. Wiesel, *Assistant Professor of Orthopaedic Surgery*
B.A. 1967, Emory University; M.D. 1971, University of Pennsylvania

Robert Shaw Wilkinson, *Associate Clinical Professor of Medicine*
B.A. 1950, Dartmouth College; M.D. 1955, New York University

Ann Lottie Barnett Williams, *Assistant Clinical Professor of Medicine*
M.B., B.S. 1965, University of London; D.M.R.C.S., L.R.C.P. 1965, Royal College of Physicians and Surgeons; D.Obst.R.C.O.G. 1966, Royal College of Obstetricians and Gynecologists

Irving Cardinal Williams, *Assistant Clinical Professor of Child Health and Development*
B.S. 1954, Morgan State University; M.D. 1964, Howard University

Jerry Randall Williams, *Research Professor of Radiology and of Pharmacology*
B.A. 1957, Texas Christian University; B.Sc. 1960, M.Sc. 1960, National University of Ireland; D.Sc. 1972, Harvard University

Marjorie Joan Williams, *Clinical Professor of Medicine*
M.D. 1943, University of Bristol

Elliot Charles Wilner, *Assistant Clinical Professor of Neurology*
B.A. 1958, Columbia University; M.D. 1962, George Washington University

Norman Louis Wilson, *Assistant Clinical Professor of Psychiatry and Behavioral Sciences*
B.S. 1959, Yale University; M.D. 1963, Harvard University

Thomas Ashton Wilson, *Clinical Professor of Obstetrics and Gynecology*
B.A. 1942, M.D. 1944, George Washington University

James William Winebright, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*
B.A. 1958, Knox College; M.S. 1963, M.D. 1964, University of Chicago

Alan William Winshel, *Assistant Clinical Professor of Obstetrics and Gynecology*
B.A. 1948, Temple University; M.D. 1952, Hahnemann Medical College

Karl Wipplinger, *Associate Professor of Medicine*
M.D. 1953, University of Vienna

James Howard Wise, *Associate Professor of Child Health and Development and of Psychiatry and Behavioral Sciences*
B.A. 1963, Adelphi University; M.A. 1965, Ph.D. 1969, George Washington University

Jarrett Michael Wise, *Associate Professor of Health Care Sciences; Director, Physician's Assistant Training Program*
B.S. in A.H.S. 1971, Duke University

Leonard Arthur Wisneski, *Associate Clinical Professor of Medicine*
B.S. 1969, Drexel University; M.D. 1973, Thomas Jefferson University

Philip Witorsch, *Professor of Medicine*
B.A. 1958, M.D. 1962, New York University

Jeffrey Francis Witte, *Clinical Instructor in Orthopaedic Surgery*
B.A. 1963, Georgetown University; M.D. 1967, University of Michigan

Ralph Emil Wittenberg, *Associate Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1956, M.D. 1960, Wayne State University

John Richard Wittenborn, Jr., *Clinical Instructor in Neurology*
A.B. 1969, Rutgers—The State University; M.D. 1973, Washington University

Elma Kahn Wolf, *Adjunct Instructor in Psychiatry and Behavioral Sciences (Social Work)*
B.A. 1928, University of California, Berkeley

Muriel Ruth DuBrow Wolf, *Associate Professor of Child Health and Development*
B.A. 1957, Smith College; M.D. 1959, Yale University

Stanley Irving Wolf, *Clinical Professor of Child Health and Development*
B.S. 1947, M.D. 1948, Georgetown University

Martin Samuel Wolfe, *Clinical Professor of Medicine*
B.A. 1957, M.D. 1961, Cornell University; D.C.M.T. 1967, London School of Hygiene and Tropical Medicine

Frederick William Wolff, *Professor of Medicine*
M.B., B.S. 1946, M.D. 1957, University of Durham, England

Mark Gary Wolfman, *Assistant Clinical Professor of Radiology*
A.B. 1967, University of Rochester; M.D. 1971, Case Western Reserve University

Steven Joel Wolin, *Associate Clinical Professor of Psychiatry and Behavioral Sciences and of Medicine*
B.A. 1962, Brown University; M.D. 1966, Yeshiva University

Sylvia Bernice Wood Wooten, *Assistant Clinical Professor of Child Health and Development*
B.S. 1963, Morgan State College; M.D. 1967, Howard University

Henry Harcus Work, *Clinical Professor of Psychiatry and Behavioral Sciences*
B.A. 1933, Hamilton College; M.D. 1937, Harvard University

Alvin Charles Wyman, *Clinical Professor of Radiology*
B.A. 1939, Cornell University; M.D. 1943, New York University

William Shigeru Yamamoto, *Professor of Clinical Engineering; Chairman of the Department of Clinical Engineering*
B.A. 1945, Park College; M.D. 1949, M.A. 1971, University of Pennsylvania

Kai-Yiu Yeung, *Assistant Clinical Professor of Medicine*
M.D. 1968, National Taiwan University

Kae Strosnider Yingling, *Assistant Clinical Professor of Radiology*
B.S. 1969, University of Maryland; M.D. 1973, George Washington University

Leon Yochelson, *Professor of Psychiatry and Behavioral Sciences*
B.A. 1938, M.D. 1942, State University of New York at Buffalo

Dal Yoo, *Assistant Clinical Professor of Medicine*
M.D. 1967, Seoul National University

Ira Sanders Young, *Assistant Clinical Professor of Urology*
B.A. 1955, Lafayette College; M.D. 1959, George Washington University

Charles Chua Yu, *Adjunct Assistant Professor of Anesthesiology*
M.D. 1956, University of Santo Tomas, Philippines

John Sam Zacharia, *Associate Professor of Ophthalmology*
B.S. 1964, M.D. 1968, American University of Beirut

Nieves Maria Zaldivar, *Clinical Instructor in Child Health and Developmen*
B.S. 1959, Institute of Havana; M.D. 1971, City University of New York, Mount Sinai Sch
of Medicine

Charles Joseph Zaloudek, *Assistant Professor of Pathology*
B.A. 1967, University of California, Berkeley; M.D. 1971, Johns Hopkins University

Paul Zamick, *Assistant Clinical Professor of Surgery (Plastic Surgery)*
B.A. 1952, University of Manitoba; L.R.C.S.I., M.D. 1958, Royal College of Surgeons, Ire

Anthony Zappala, *Assistant Professorial Lecturer in Psychiatry and Behavio*
Sciences
M.D. 1942, George Washington University

Marion M. Zatz, *Adjunct Associate Professor of Biochemistry*
B.A. 1965, Columbia University; Ph.D. 1970, Cornell University

Bernard Harold Zeavin, *Assistant Clinical Professor of Ophthalmology*
M.D. 1950, University of Manitoba

Jack Arnold Zeller, *Assistant Professor of Pathology (Laboratory Medicine)*
B.A. 1960, Columbia University; M.D. 1964, New York Medical College

Alan Barry Zients, *Assistant Clinical Professor of Psychiatry and Behavio*
Sciences and of Child Health and Development
B.A. 1959, Dartmouth College; M.D. 1963, New York University

Ernest Michael Zimmerman, *Assistant Clinical Professor of Ophthalmology*
M.D. 1963, University of Toronto

Hyman Joseph Zimmerman, *Professor of Medicine*
B.A. 1936, University of Rochester; M.A. 1938, M.D. 1942, Stanford University

Isaiah Morris Zimmerman, *Associate Clinical Professor of Psychiatry and B*
havioral Sciences
B.A. 1951, M.S.W. 1953, University of California, Berkeley; Ph.D. 1967, Catholic Univers
of America

Jack Evans Zimmerman, *Professor of Anesthesiology*
B.S. 1960, University of Maryland; M.D. 1964, George Washington University

Lorenz Eugene Zimmerman, *Clinical Professor of Ophthalmology and of*
Ophthalmic Pathology
B.A. 1943, M.D. 1945, George Washington University

Mervin Harvey Zimmerman, *Assistant Clinical Professor of Ophthalmology*
M.D. 1959, University of Toronto

John Zinner, *Associate Clinical Professor of Psychiatry and Behavioral Scienc*
B.A. 1958, Amherst College; M.D. 1963, Harvard University

Bernard Charles Zook, *Associate Professor of Pathology (Comparative Patho*
ogy)
B.S. 1962, D.V.M. 1963, Colorado State University

Assistants in Research and Instruction 1980–81

Leela A. Achankunju, *Assistant in Physical Medicine and Rehabilitation*
M.B., B.S. 1973, Kottayam Medical College, India

Naseer Ahmad, *Assistant in Pathology*
M.B., B.S. 1975, Dow Medical College, Karachi

Moses Kadranel Albert, *Assistant in Dermatology*
B.S. 1974, Georgetown University; M.D. 1978, Washington University

Susan Jennifer Albert, *Assistant in Anesthesiology*
B.A. 1974, M.S. 1975, University of Pennsylvania; D.O. 1979, Philadelphia College of Osteopathic Medicine

Christian Oritsetimeyin Alele, *Assistant in Nuclear Medicine*
M.B., B.S. 1955, Welsh National School of Medicine

Amerzeki Al-Juburi, *Assistant in Urology*
M.B., Ch.B. 1968, Baghdad Medical College

Harold Hayes Allen, Jr., *Assistant in Orthopaedic Surgery*
B.A. 1972, M.D. 1976, University of Virginia

Yorke Allen III, *Assistant in Medicine*
A.B. 1973, Harvard University; M.D. 1978, Case Western Reserve University

Andrew Stephen Anderson, *Assistant in Anesthesiology*
A.B. 1966, King College, Tennessee; M.A., Ph.D. 1971, Yale University; M.D. 1976, University of Tennessee

William Leighton Anixter, *Assistant in Psychiatry*
B.S. 1973, University of California, Berkeley; M.D. 1977, George Washington University

Jonathan Robert Anolik, *Assistant in Medicine*
M.D. 1977, Loyola University of Chicago, Stritch School of Medicine

Henry F.X. Baron, *Assistant in Pathology*
B.S. 1968, Georgetown University; M.D. 1978, L'Universite Catholique de Louvain

Bruce Jonathan Barron, *Assistant in Nuclear Medicine*
M.D. 1975, University of South Florida

Peter Basch, *Assistant in Medicine*
B.A. 1974, Trinity College; M.D. 1978, George Washington University

Barbara Lee Bass, *Assistant in Surgery*
B.S. 1975, Tufts University; M.D. 1979, University of Virginia

Shantikumar D. Bedmutha, *Assistant in Nuclear Medicine*
M.B., B.S. 1971, Government Medical College, India

Joseph Michael Bender, *Assistant in Radiology*
B.S. 1972, Georgetown University; M.D. 1976, Thomas Jefferson University

Mark Benjamin, *Assistant in Medicine*
B.S. 1970, Rensselaer Polytechnic Institute; M.S. 1972, Pennsylvania State University; M.D. 1977, Medical College of Wisconsin

Bradley H. Bennett, *Assistant in Surgery*
B.S. 1973, Tufts University; M.D. 1977, Georgetown University

Robert M. Berger, *Assistant in Urology*
B.A. 1972, State University of New York at Binghamton; M.D. 1976, State University of New York Upstate Medical Center

Larry Joseph Bernstein, *Assistant in Radiology*
B.S. 1973, Union College; M.D. 1976, New York Medical College

Terence Bertele, *Assistant in Medicine*
B.A. 1969, New York University; M.D. 1978, University of Perugia, Italy

Marilyn Berzin, *Assistant in Dermatology*
B.A. 1973, Connecticut College; M.D. 1979, Albert Einstein College of Medicine

Joseph Gabriel Birnbaum, *Assistant in Medicine*
B.S. 1969, Cornell University; M.D. 1973, Hahneman Medical College

Penny Lynn Bisk, *Assistant in Medicine*
B.A. 1973, Rutgers—The State University, Douglass College; M.D. 1977, Cornell Univ

Constance Bohon, *Assistant in Obstetrics and Gynecology*
B.A. 1974, Mount Holyoke College; M.D. 1978, George Washington University

Jean Crowell Bolan, *Assistant in Obstetrics and Gynecology*
B.S. 1972, M.D. 1976, University of North Carolina

Willem Henry Boom, *Assistant in Medicine*
B.A. 1975, Amherst College; M.D. 1979, University of Rochester

Bruce Jason Bortnick, *Assistant in Radiology*
B.S. 1975, George Washington University; M.D. 1979, Howard University

John Additon Bradford, *Assistant in Orthopaedic Surgery*
B.A. 1972, Bowdoin College; M.D. 1978, Medical College of Wisconsin

Frank Westbrook Braxton, *Assistant in Medicine*
B.A 1971, M.D. 1975, Temple University

George B. Bren, *Assistant in Medicine*
B.S. 1973, M.D. 1975, Northwestern University

Joyce Ellen Brody, *Assistant in Obstetrics and Gynecology*
B.A. 1974, M.D. 1978, University of Pennsylvania

Martin Howard Brown, *Assistant in Medicine*
B.S. 1974, M.D. 1978, George Washington University

Nancy Elizabeth Bruckner, *Assistant in Dermatology*
B.A. 1972, University of Pennsylvania; M.D. 1976, George Washington University

Jonca Camille Bull, *Assistant in Ophthalmology*
A.B. 1974, Princeton University; M.D. 1978, Duke University

Douglas George Burnette, Jr., *Assistant in Pediatric Radiology*
B.S. 1972, Birmingham Southern College; M.D. 1975, University of Alabama

Nicolas G. Cacciabeve, *Assistant in Pathology*
B.S. 1975, Fairleigh Dickinson University; M.D. 1979, Georgetown University

John Michael Camas, *Assistant in Surgery*
B.S. 1973, University of Notre Dame; M.D. 1977, Thomas Jefferson University

Ronald Edward Capstack, *Assistant in Surgery*
B.S. 1970, M.D. 1978, Georgetown University

Clifford Hugh Carlson, *Assistant in Clinical Engineering*
B.A. 1969, M.D. 1977, Cornell University; M.S.E. 1971, University of Pennsylvania

Thomas Stephen Cerasaro, *Assistant in Surgery*
B.S. 1975, Bucknell University; M.D. 1979, Georgetown University

Luis Augusto Cervantes, *Assistant in Neurological Surgery*
M.D. 1976, National University of Mexico

Clara Suet-Phang Chan, *Assistant in Medicine*
B.S. 1972, Mary Manse College; M.D. 1976, George Washington University

Paul Louis Chandeysson, *Assistant in Nuclear Medicine*
B.S. 1958, Washington University; M.S. 1963, Stanford University; M.D. 1976, George Washington University

athleen Frances Cheyney, *Assistant in Thoracic Surgery*
A.B. 1970, Ohio Wesleyan University; M.D. 1974, Thomas Jefferson University

lay Lin Chin, *Assistant in Anesthesiology*
M.B., B.S. 1975, University of Melbourne, Australia

rthur Oi-Shui Chiu, *Assistant in Pathology*
B.S. 1968, Chung Chi College, Hong Kong; Ph.D. 1973, University of Pennsylvania; M.D. 1978, Thomas Jefferson University

orinne Elisabeth de Cholnoky, *Assistant in Obstetrics and Gynecology*
B.A. 1973, M.D. 1979, Harvard University

erence Louis Chorba, *Assistant in Medicine*
B.A. 1971, Columbia College; B.A. 1975, Oxford University; M.D. 1979, State University of New York at Buffalo

lan Bentley Claunch, *Assistant in Medicine*
B.A. 1972, Long Island University, C.W. Post Center; M.D. 1977, Louisiana State University

oderick John Clemente, *Assistant in Neurological Surgery*
B.A. 1972, Cornell University; M.D. 1978, University of Rome

ichard Edward Coin, *Assistant in Surgery*
B.A. 1975, University of Virginia; M.D. 1979, Eastern Virginia Medical School

lartha Toma Cole, *Assistant in Obstetrics and Gynecology*
B.A. 1967, Vassar College; M.D. 1977, George Washington University

ennis Lawrence College, *Assistant in Medicine*
B.A. 1968, University of South Florida; M.D. 1976, Bowman-Gray School of Medicine

aul Michael Colombani, *Assistant in Surgery*
A.B. 1972, St. Anselm's College; M.D. 1976, University of Kentucky

olleen A. Conley, *Assistant in Psychiatry*
B.A. 1974, M.D. 1978, University of Colorado

ictoria Ann Conn, *Assistant in Pathology*
B.A. 1973, Bennington College; M.D. 1979, College of Medicine and Dentistry of New Jersey, Rutgers Medical School

ichard Edmund Cytowic, *Assistant in Neurology*
B.A. 1973, Duke University; M.D. 1977, Bowman-Gray School of Medicine

lary Margaret Davis, *Assistant in Obstetrics and Gynecology*
B.A. 1973, Bryn Mawr College; M.D. 1977, University of Virginia

llen Glover Delaney, *Assistant in Anesthesiology*
B.S. 1970, M.D. 1974, University of Florida

avid E. Denekas, *Assistant in Medicine*
A.B. 1974, Brown University; M.D. 1978, Stanford University

avid Bernard Doman, *Assistant in Medicine*
B.A. 1973, New York University; M.D. 1976, Eastern Virginia Medical College

ndrew Oliver Donelson, *Assistant in Medicine*
B.S. 1971, Tulane University; M.D. 1975, University of Tennessee

Mai-Li Dong, *Assistant in Anesthesiology*
B.S. 1972, Simmons College; M.D. 1978, University of Gama Filho of Rio de Janeiro

ohn Doppelheuer, *Assistant in Obstetrics and Gynecology*
B.A. 1974, M.D. 1978, George Washington University

Martin Walter Dukes, Jr., *Assistant in Obstetrics and Gynecology*
B.S. 1968, Wilberforce University; M.D. 1977, University of Nebraska

eter Spencer Dunner, *Assistant in Radiology*
B.A. 1966, M.A., Ph.D. 1969, City University of New York; M.D. 1976, New York Medical College

Thomas Edward Ein, *Assistant in Obstetrics and Gynecology*
B.S. 1972, M.D. 1978, George Washington University

Larry Steven Eisenfeld, *Assistant in Orthopaedic Surgery*
B.S. 1972, Muhlenberg College; M.D. 1977, George Washington University

Helene Audrey Emsellem, *Assistant in Neurology*
M.D. 1977, George Washington University

Edward A. Engle, *Assistant in Neurological Surgery*
B.A. 1969, Catholic University of America; M.S. 1971, Florida University; M.D. 19
Thomas Jefferson University

Jay Stuart Epstein, *Assistant in Medicine*
A.B. 1969, Harvard University; M.D. 1976, State University of New York Downstate Medi
Center

Serle Mindel Epstein, *Assistant in Medicine*
B.A. 1975, Columbia University; M.D. 1979, City University of New York, Mount Sinai Sch
of Medicine

Jose Maria Esteban, *Assistant in Pathology*
M.D. 1975, University of Salamanca, Spain

Abayomi Fakunle, *Assistant in Neurology*
M.B., B.S. 1972, University of Lagos, Nigeria

Joachim Jack Fanale, *Assistant in Obstetrics and Gynecology*
A.B. 1972, Rutgers—The State University; M.D. 1977, College of Medicine and Dentistry
New Jersey, New Jersey Medical School

Gary Richard Fender, *Assistant in Medicine*
A.B. 1975, Boston University; M.D. 1979, College of Medicine and Dentistry of New Jers
New Jersey Medical School

Katherine Antonia Ferguson, *Assistant in Psychiatry*
A.B. 1968, Sarah Lawrence College; B.S. 1975, University of Washington; M.D. 1979 Geo
Washington University

Jerome S. Fischer, *Assistant in Medicine*
M.D. 1977, Thomas Jefferson University

Henry James Fishman, *Assistant in Medicine*
B.A. 1975, Amherst College; M.D. 1979, University of Rochester

Thomas B. Fleeter, *Assistant in Orthopaedic Surgery*
B.A. 1973, Northwestern University; M.D. 1979, Howard University

Glenn H. Fuchs, *Assistant in Dermatology*
B.A. 1973, M.D. 1977, New York University

Louis Vincent Gabaldoni, *Assistant in Obstetrics and Gynecology*
B.S. 1973, University of Massachusetts; M.D. 1978, University of Maryland

Larry Ira Galblum, *Assistant in Pathology*
B.S. 1975, George Washington University; M.D. 1979, University of Maryland

David Reeder Gens, *Assistant in Surgery*
B.A. 1969, University of Pennsylvania; M.D. 1976, University of Brussels, Belgium

Naurang Singh Gill, *Assistant in Neurology*
B.S. 1969, Government College, Ludhiana, India; M.B., B.S. 1974, Government Medical Colle
Amritsar, India

Gregory Mark Gillette, *Assistant in Medicine*
B.A. 1972, Knox College; M.D. 1979, University of North Carolina

Peter James Gkonos, *Assistant in Medicine*
B.S. 1974, University of Michigan; M.D. 1978, Thomas Jefferson University

Kenneth David Gold, *Assistant in Medicine*
B.A. 1973, Amherst College; M.D. 1977, Baylor College of Medicine

Sheldon Elliott Goldberg, *Assistant in Surgery*
B.S. 1973, M.D. 1977, Georgetown University

Neil Howard Goldstein, *Assistant in Medicine*
B.A. 1974, Brandeis University; M.D. 1979, University of Massachusetts

Mary Beck Gorman, *Assistant in Anesthesiology*
B.S. 1974, State University of New York at Albany; M.D. 1978, State University of New York Downstate Medical Center

Mark S. Gorovoy, *Assistant in Ophthalmology*
A.B. 1973, Duke University; M.D. 1977, George Washington University

Usha Sachder Gulati, *Assistant in Physical Medicine and Rehabilitation*
M.B., B.S. 1959, Christian Medical College, Ludhiana, India

Laura Ann Harper, *Assistant in Medicine*
B.A. 1974, Sarah Lawrence College; M.D. 1979, University of Connecticut

Susan Marie Hasselquist, *Assistant in Medicine*
B.S. 1974, University of Wisconsin–River Falls; M.D. 1978, University of Wisconsin

Steven Carl Hausmann, *Assistant in Orthopaedic Surgery*
A.B. 1973, Princeton University; M.D. 1977, University of Cincinnati

Mark Ronald Heilbrunn, *Assistant in Pathology*
B.A. 1960, Reed College; M.D. 1965, University of Washington

Mitchell James Heiman, *Assistant in Medicine*
A.B. 1968, Washington University; M.D. 1977, Universite Libre de Bruxelles

Humberto Frias Henriquez, *Assistant in Medicine*
B.A. 1974, Lincoln University; M.D. 1979, Temple University

John Edward Herring, Jr., *Assistant in Medicine*
B.S. 1972, M.D. 1977, University of Maryland

Joanne Herrman, *Assistant in Obstetrics and Gynecology*
B.S. 1975, M.D. 1979, University of Pittsburgh

Elisabeth K. Herz, *Assistant in Psychiatry*
M.D. 1951, University of Vienna, Austria

Mary H. Heslin, *Assistant in Obstetrics and Gynecology*
B.A. 1974, M.D. 1978, George Washington University

Barbara Ellen Hoeck, *Assistant in Radiology*
B.A. 1972, Bryn Mawr College; M.D. 1978, George Washington University

Carole Elizabeth Horn, *Assistant in Medicine*
B.A. 1966, Brandeis University; M.A. 1969, Columbia University; M.D. 1978, George Washington University

Janet Evelyn Horn, *Assistant in Obstetrics and Gynecology*
B.A. 1972, Vanderbilt University; M.D. 1978, George Washington University

Stuart Lawrence Horwitz, *Assistant in Medicine*
A.B. 1972, Colgate University; M.D. 1978, George Washington University

Susan Lynne Hunker, *Assistant in Medicine*
B.S. 1976, Pennsylvania State University; M.D. 1978, Thomas Jefferson University

Dale Hilton Isaacson, *Assistant in Dermatology*
M.D. 1977, George Washington University

Sandra Anne Schwartz Isbister, *Assistant in Radiology*
B.S. 1973, University of Colorado; M.D. 1978, University of Maryland

Jeff Jacobson, *Assistant in Neurological Surgery*
B.A. 1973, University of Rochester; M.D. 1977, George Washington University

Saied Jamshidi, *Assistant in Neurological Surgery*
M.D. 1974, University of Tehran

Jack Charles Jawitz, *Assistant in Dermatology*
B.S. 1972, University of Maryland; M.D. 1977, State University of New York Downstate Me
cal Center

Kaethe Wechsler-Jentzsch, *Assistant in Radiology*
M.D. 1964, Freie Universitat, Berlin

Marilyn Concetta Jerome, *Assistant in Obstetrics and Gynecology*
B.S. 1974, Xavier University; M.D. 1978, University of Cincinnati

Frank Bacchus Johnson, Jr., *Assistant in Anesthesiology*
B.S. 1971, Boston University; M.D. 1978, University of Michigan

Judith A. Johnson, *Assistant in Anesthesiology*
B.A. 1974, Mount Holyoke College; M.D. 1978, University of Pennsylvania

Stanley S. Josef, *Assistant in Medicine*
B.S. 1973, M.D. 1977, Georgetown University

Fred Thomas Kahn, *Assistant in Medicine*
B.S. 1974, College of William and Mary; M.D. 1979, Medical College of Virginia of Virg
Commonwealth University

Howard Leonard Kantor, *Assistant in Medicine*
B.A. 1971, Brandeis University; M.D., Ph.D. 1978, Yale University

Scott Douglas Kantor, *Assistant in Urology*
M.D. 1975, New York Medical College

Keith B. Kapatkin, *Assistant in Medicine*
B.S. 1974, Yale University; M.D. 1978, State University of New York Downstate Medi
Center

Alan Newman Kaplan, *Assistant in Obstetrics and Gynecology*
B.A. 1971, M.D. 1978, George Washington University

Najmaldin Omer Karim, *Assistant in Neurological Surgery*
M.B., Ch.B. 1978, Mosul Medical College, Iraq

Ava Anita Kaufman, *Assistant in Medicine*
B.A. 1975, Yale University; M.D. 1979, Case Western Reserve University

Helen Ho Kay, *Assistant in Obstetrics and Gynecology*
B.A. 1975, University of Chicago; M.D. 1979, Yale University

Marc Sheldon Keller, *Assistant in Radiology*
A.B. 1973, Hamilton College; M.D. 1977, George Washington University

Evan Mitchell Klass, *Assistant in Medicine*
M.D. 1976, New York Medical College

Mark Elliot Klein, *Assistant in Radiology*
B.S. 1972, Union College; M.D. 1978, State University of New York Downstate Medi
Center

Andrew Young Kleinman, *Assistant in Surgery*
B.S. 1975, Massachusetts Institute of Technology; M.D. 1979, University of Rochester

Lev Bentsionovich Klempner, *Assistant in Pathology*
M.D. 1971, I Moscow Medical School

Prudence Parcher Kline, *Assistant in Medicine*
B.A. 1972, Oberlin College; M.D. 1978, College of Medicine and Dentistry of New Je
Rutgers Medical School

Ezriel Edward Kornel, *Assistant in Neurological Surgery*
A.B. 1974, Cornell University; M.D. 1978, Rush Medical College

Michael Kornreich, *Assistant in Radiology*
B.A. 1971, M.D. 1976, George Washington University

Joseph Benjamin Koscielniak, *Assistant in Orthopaedic Surgery*
B.S. 1975, Alliance College; M.D. 1979, Indiana University

Moti Lal Koul, *Assistant in Medicine*
M.B., B.S. 1968, Medical College Hospital, Kashmir, India

Walter Krieger, *Assistant in Anesthesiology*
B.S. 1974, Oregon State University; M.D. 1978, University of Oregon

James Richard Kunec, *Assistant in Orthopaedic Surgery*
B.A. 1974, Johns Hopkins University; M.D. 1978, Georgetown University

Panagiotis Labropoulos, *Assistant in Orthopaedic Surgery*
M.D. 1971, Athens University Medical School, Greece

Francis Leonard Lally, *Assistant in Medicine*
B.S. 1972, Saint Vincent College; M.D. 1976, Hahnemann Medical College

Jeffrey H. Landau, *Assistant in Urology*
B.A. 1972, George Washington University; M.D. 1978, New York Medical College

Pearon Gordon Lang, *Assistant in Dermatology*
B.A. 1966, M.D. 1970, University of Virginia

Joseph T. Latack, *Assistant in Radiology*
M.D. 1969, University of Michigan

Roy Leiboff, *Assistant in Medicine*
B.S., B.A. 1972, Tufts University; M.D. 1975, New York Medical College

Joan Schaap Leitzer, *Assistant in Psychiatry*
B.A. 1969, Barnard College; M.D. 1979, Georgetown University

Steven David Lerner, *Assistant in Medicine*
B.A. 1972, M.D. 1976, University of Minnesota

Bradley Howard Levin, *Assistant in Surgery*
B.A. 1972, West Virginia University; M.D. 1976, Bowman-Gray School of Medicine

David Jay Levine, *Assistant in Obstetrics and Gynecology*
B.A. 1972, Rutgers—The State University; M.D. 1976, Autonomous University of Guadalajara

Peter Douglas Levit, *Assistant in Medicine*
B.A. 1968, Adelphi University; M.D. 1976, New York Medical College

Miriam Levy, *Assistant in Radiology*
B.S. 1975, City University of New York, Brooklyn College; M.D. 1979, Albert Einstein College of Medicine

David Michael Lewis, *Assistant in Psychiatry*
B.S. 1973, University of Georgia; M.D. 1977, Medical College of Georgia

Walter P. Lischick, *Assistant in Surgery*
B.S. 1974, M.D. 1979, Georgetown University

Thomas Jesse Locke, *Assistant in Medicine*
M.D. 1978, Howard University

Carol Ann Ludolph, *Assistant in Neurological Surgery*
A.B. 1972, Temple University; M.D. 1976, Medical College of Pennsylvania

Carol Lynn Ludwig, *Assistant in Neurology*
A.B. 1969, Bryn Mawr College; M.D. 1974, Columbia University

Harvey Simon Luksenburg, *Assistant in Medicine*
B.A. 1973, M.D. 1977, University of Chicago

Michael A. Manganiello III, *Assistant in Ophthalmology*
B.A. 1972, University of Dayton; M.D. 1976, McMaster University School of Medicine, Canada

Emanuele Mannarino, *Assistant in Physical Medicine and Rehabilitation*
M.D. 1951, University of Rome; M.D. 1973, Duke University

Matthew Joseph Marano, *Assistant in Ophthalmology*
A.B. 1974, Columbia University; M.D. 1978, George Washington University

James William Marcucci, *Assistant in Medicine*
B.S. 1971, M.D. 1975, University of Pittsburgh

John George Mardiat, *Assistant in Radiology*
B.A. 1973, M.D. 1979, University of Missouri—Kansas City

Randall Jay Margolis, *Assistant in Dermatology*
A.B. 1971, Miami University; M.D. 1975, Ohio State University

Renato Mariani, *Assistant in Pathology*
M.D. 1976, University of Rome

Gary Stephen Marrone, *Assistant in Orthopaedic Surgery*
B.S.E.E. 1970, University of Notre Dame; M.D. 1976, Georgetown University

Kenneth Grant Mason, *Assistant in Surgery*
B.S. 1969, Carroll College; M.D. 1977, Howard University

David B. McDonald, *Assistant in Medicine*
B.A. 1975, University of Oklahoma; M.D. 1979, University of Chicago

Judson Chase McGowan, *Assistant in Orthopaedic Surgery*
B.S. 1969, University of Rochester; M.D. 1978, George Washington University

Joan McIlhenny, *Assistant in Radiology*
B.A. 1973, Harvard University; M.D. 1977, University of Pennsylvania

Richard Ellison McWhorter, *Assistant in Radiology*
B.S. 1973, Fairmont State College; M.D. 1978, West Virginia University

Mohamed Aziz Medhat, *Assistant in Physical Medicine and Rehabilitation*
M.B., B.Ch. 1954, Cairo University

Frank S. Melograna, *Assistant in Urology*
B.S. 1971, Tufts University; M.D. 1975, Temple University

Beatriz C. Mendez, *Assistant in Obstetrics and Gynecology*
B.S. 1974, M.D. 1979, Pennsylvania State University

Martha Caroline Michalski, *Assistant in Medicine*
B.A. 1971, Oakland University; M.D. 1978, Washington University

Kenneth Victor Miselis, *Assistant in Ophthalmology*
S.B. 1974, Medical Institute of Technology; M.D. 1979, University of Vermont

Marta M. Mondino, *Assistant in Anesthesiology*
M.D. 1972, University of Cordoba, Argentina

Swami Nathan, *Assistant in Neurological Surgery*
M.D. 1973, Madras University

Richard Lawrence Needleman, *Assistant in Orthopaedic Surgery*
B.S. 1975, University of Michigan; M.D. 1979, University of Vermont

Richard S. Newman, *Assistant in Obstetrics and Gynecology*
B.S. 1974, Tufts University; M.D. 1978, George Washington University

Alan Ney, *Assistant in Medicine*
B.S. 1971, St. Lawrence University; M.D. 1975, George Washington University

Jay Ira Novetsky, *Assistant in Ophthalmology*
B.S. 1975, University of Michigan, Dearborn; M.D. 1979, Wayne State University

John Sebastian O'Brien II, *Assistant in Psychiatry*
B.A. 1975, University of Delaware; M.D. 1979, Thomas Jefferson University

Gerard S. O'Connor, *Assistant in Surgery*
B.S. 1973, M.D. 1978, Georgetown University

Esther Ocuin, *Assistant in Medicine*
M.D. 1976, University of Bologna, Italy

Gregory Chet Oliver, *Assistant in Surgery*
B.A. 1972, Colgate University; M.D. 1976, George Washington University

Eric Alfred Oristian, *Assistant in Surgery*
B.S. 1974, Duke University; M.D. 1978, Georgetown University

Sami Joseph Oweida, *Assistant in Surgery*
B.A. 1975, Denison University; M.D. 1979, University of Pittsburgh

David M. Pagnanelli, *Assistant in Neurological Surgery*
B.A. 1972, Temple University; M.D. 1976, George Washington University

Hasmukh R. Patel, *Assistant in Medicine*
M.B., B.S. 1975, Seth G.S. Medical College, India

Ophelia Clarke Patterson, *Assistant in Ophthalmology*
B.S. 1966, Virginia Union University; M.A. 1970, Catholic University of America; M.D. 1976, University of Maryland

Thomas Costo Peff, *Assistant in Orthopaedic Surgery*
A.B. 1971, Princeton University; M.D. 1975, University of Virginia

Regio Teodoro Penna, *Assistant in Cytopathology*
M.D. 1970, Faculdade de Medicina de UFF, Brazil

Gerald Paul Perman, *Assistant in Psychiatry*
B.S. 1971, B.S. 1972, M.D. 1977, University of Maryland

Michael Howard Phillips, *Assistant in Surgery*
B.A. 1974, Washington University; M.D. 1979, University of Colorado

Peter Charles Pieslor, *Assistant in Nuclear Medicine*
B.S. 1970, Villanova University; M.D. 1974, College of Medicine and Dentistry of New Jersey, New Jersey Medical School

Donna Marie Pittman, *Assistant in Surgery*
B.S. 1975, George Washington University; M.D. 1979, Georgetown University

George Anthony Pjura, *Assistant in Nuclear Medicine*
B.S. 1967, Boston College; M.S. 1969, University of Virginia; M.D. 1978, University of Connecticut

David Neil Powers, *Assistant in Obstetrics and Gynecology*
B.S. 1973, Dartmouth College; M.D. 1977, University of Pennsylvania

Gordon Wesley Price, *Assistant in Surgery*
A.B. 1972, University of North Carolina; M.D. 1977, Bowman-Gray School of Medicine

William Melvin Price, *Assistant in Orthopaedic Surgery*
A.B. 1975, M.D. 1979, St. Louis University

Paul George Prunier, *Assistant in Psychiatry*
B.S. 1972, Tufts University; M.D. 1977, Universita degli Studi di Roma

Jan Robert Purgess, *Assistant in Medicine*
B.A. 1970, State University of New York at Binghamton; M.D. 1974, State University of New York at Buffalo

Suzanne Marie Quenneville, *Assistant in Anesthesiology*
B.A. 1972, Catholic University of America; M.D. 1977, Universidad de Monterrey

James Michael Quigley, *Assistant in Radiology*
A.B. 1971, Wesleyan University; M.D. 1976, George Washington University

Michael Paul Rafferty, *Assistant in Medicine*
B.A. 1974, Amherst College; M.D. 1979, Boston University

Elizabeth Ivy Read, *Assistant in Medicine*
A.B. 1973, Bryn Mawr College; M.D. 1977, State University of New York at Buffalo

Concepcion Aglipay Regacho, *Assistant in Anesthesiology*
B.S. 1969, M.D. 1973, University of Santo Tomas, Philippines

Lawrence Michael Reiss, *Assistant in Medicine*
B.A. 1973, Yeshiva University; M.D. 1977, State University of New York Downstate Medical Center

Steven Michael Reznick, *Assistant in Surgery*
B.S. 1975, University of Maryland; M.D. 1979, George Washington University

Kurt Lee Rhymers, *Assistant in Obstetrics and Gynecology*
B.S. 1966, U.S. Military Academy; M.S. 1971, Stanford University; M.D. 1977, George Washington University

Jesse Andrew Roberts, *Assistant in Medicine*
B.A. 1972, Washington University; M.D. 1976, George Washington University

Elmer Arthur Robertson, *Assistant in Pathology*
B.A. 1966, Columbia Union College; M.A. 1967, Andrews University; M.D. 1971, Loma Linda University

Michael David Robinson, *Assistant in Psychiatry*
A.B. 1975, Harvard University; M.D. 1979, Johns Hopkins University

Neil Howard Robinson, *Assistant in Ophthalmology*
B.S. 1974, M.D. 1978, Tulane University

Eric Gibson Rodriguez, *Assistant in Medicine*
B.A. 1969, M.D. 1979, George Washington University; M.Phil. 1973, Yale University

Steven James Rooney, *Assistant in Radiology*
B.S. 1975, Lafayette College; M.D. 1979, Thomas Jefferson University

Louis D. Rosenfield, *Assistant in Medicine*
B.A. 1974, M.D. 1977, George Washington University

Robert Edward Rosenthal, *Assistant in Medicine*
B.A. 1975, Yale University; M.D. 1979, New York University

Jeffrey Louis Roth, *Assistant in Medicine*
B.S. 1971, M.D. 1978, University of Miami

Jeffrey Stuart Rothburd, *Assistant in Medicine*
A.B. 1972, Rutgers—The State University; M.D. 1976, State University of New York Downstate Medical Center

Catherine Hyde Ryan, *Assistant in Medicine*
A.B. 1974, Cornell University; M.D. 1979, Washington University

Sander Barry Saidman, *Assistant in Radiology*
B.A. 1974, Washington University; M.D. 1978, George Washington University

Daniel Howard Saltzman, *Assistant in Obstetrics and Gynecology*
B.S. 1975, State University of New York at Stony Brook; M.D. 1979, State University of New York at Buffalo

Caroline Samuels, *Assistant in Medicine*
A.B. 1970, Wellesley College; M.D. 1975, University of Connecticut

Noriko Sato, *Assistant in Pathology*
B.S. 1959, M.D. 1963, Hokkaido University, Japan

George Joseph Saviano, *Assistant in Medicine*
B.S. 1971, The Cooper Union; M.D. 1977, New York Medical College

Craig J. Schaefer, *Assistant in Surgery*
B.S. 1970, Rutgers—The State University; M.D. 1974, Albany Medical College

Richard Gerard Schmitt, *Assistant in Medicine*
B.A. 1972, Adelphi University; M.D. 1976, Georgetown University

David Allen Schreiner, *Assistant in Medicine*
B.A. 1972, Boston University; M.D. 1978, College of Medicine and Dentistry of New Jersey, New Jersey Medical School

Jeffrey Michael Schulman, *Assistant in Obstetrics and Gynecology*
B.A. 1973, M.D. 1977, George Washington University

Lee Edward Schwab, *Assistant in Medicine*
B.A. 1970, Franklin and Marshall College; M.D. 1974, Hahnemann Medical College

Kathleen Shaheen, *Assistant in Pathology*
B.S. 1968, Trinity College, District of Columbia; M.D. 1976, Universidad Autonoma de Guadalajara

John Michel Shamma'a, *Assistant in Medicine*
B.S. 1975, American University of Beirut; M.D. 1978, Emory University

Steven M. Sharpe, *Assistant in Medicine*
B.C.S. 1972, University of Michigan; M.D. 1979, Tufts University

Edwina Marguerite Shelford, *Assistant in Anesthesiology*
B.S. 1964, George Washington University; M.D. 1969, Woman's Medical College of Pennsylvania

Marc R. Shepard, *Assistant in Medicine*
B.S. 1974, University of Michigan; M.D. 1978, Northwestern University

David Jacob Shiling, *Assistant in Neurology*
B.A. 1969, University of Pennsylvania; M.D. 1973, University of Maryland

Barbara Rose Shoback, *Assistant in Medicine*
B.A. 1974, Vassar College; M.M.S. 1976, College of Medicine and Dentistry of New Jersey, Rutgers Medical School; M.D. 1979, Washington University

Karen Patricia Sigel, *Assistant in Medicine*
B.S. 1975, University of Maryland; M.D. 1979, University of Rochester

Mark Alan Silver, *Assistant in Medicine*
B.S. 1975, University of Michigan; M.D. 1979, University of Pennsylvania

James Alan Simon, *Assistant in Obstetrics and Gynecology*
B.A. 1974, Washington University; M.D. 1978, Rush Medical College

Steven Andrew Simonsen, *Assistant in Orthopaedic Surgery*
B.S. 1972, St. Lawrence University; M.D. 1976, George Washington University

Richard Glade Smith, *Assistant in Surgery*
B.S. 1973, Brigham Young University; M.D. 1976, George Washington University

Mark Harvey Snyder, *Assistant in Medicine*
B.S. 1975, Pennsylvania State University; M.D. 1979, Thomas Jefferson University

Susan Deborah Stein, *Assistant in Surgery*
B.A. 1972, Ohio Wesleyan University; M.D. 1976, Medical College of Pennsylvania

Clyde Arthur Strang, *Assistant in Urology*
B.A. 1973, Hood College; M.D. 1977, University of Maryland

Sherwin Douglas Straus, *Assistant in Medicine*
B.A. 1973, State University of New York at Binghamton; M.D. 1979, New York Medical College

Jack Daniel Summer, *Assistant in Medicine*
B.A. 1973, M.D. 1978, University of Michigan

Mahinder K. Tak, *Assistant in Radiology*
M.B., B.S. 1969, Lady Hardinge Medical College, India

James Chung-ming Tang, *Assistant in Anesthesiology*
B.S. 1967, M.D. 1967, National Defense Medical Center, Taiwan

Steven Taub, *Assistant in Medicine*
BA. 1974, City University of New York; M.D. 1978, George Washington University

Patricia Ann Thomas, *Assistant in Medicine*
B.A. 1972, Colby College; M.D. 1976, College of Medicine and Dentistry of New Jer
Rutgers Medical School

Mercy Thomaskutty, *Assistant in Anesthesiology*
B.S.C. 1970, Fatima Mata National College, India; M.B., B.S. 1976, Kerala University, India

David Huntington Thorpe, *Assistant in Anesthesiology*
B.A. 1976, M.D. 1979, University of Vermont

Candace Sharon Thurston, *Assistant in Obstetrics and Gynecology*
B.A. 1968, Howard University; M.D. 1979, Yale University

Howard L. Tice, *Assistant in Medicine*
B.S. 1973, M.D. 1977, University of South Dakota

Alice Baluck Tinker, *Assistant in Psychiatry*
B.S. 1972, University of Maryland; M.S. 1978, M.D. 1978, George Washington University

Martin Stanley Topiel, *Assistant in Medicine*
B.A. 1975, University of Rochester; M.D. 1979, New York University

James L. Torrens, *Assistant in Surgery*
B.A. 1975, Johns Hopkins University; M.D. 1979, Georgetown University

Julia Weinstein Tossell, *Assistant in Psychiatry*
B.S. 1969, Harvard University; M.A. 1970, Columbia University; M.D. 1978, George Washing
ton University

Mary V. Tsourmas, *Assistant in Pathology*
B.A. 1974, West Virginia University; M.D. 1978, Georgetown University

Nicholas F. Tsourmas, *Assistant in Orthopaedic Surgery*
B.A. 1973, Northwestern University; M.D. 1978, Georgetown University

Paul Adrian Tudder, *Assistant in Obstetrics and Gynecology*
B.A. 1973, Temple University; M.D. 1978, Autonomous University of Guadalajara

Robin Marianne Ulanow, *Assistant in Surgery*
A.B. 1974, Smith College; M.D. 1978, University of Maryland

Bashir Muhammad Ulvi, *Assistant in Plastic Surgery*
M.B., B.S. 1963, King Edward Medical College, West Pakistan

Bruce Anthony VanBoeckel, *Assistant in Medicine*
B.S. 1974, Yale University; M.D. 1978, Harvard University

Denise Kay VanHorn-Haigler, *Assistant in Pathology*
B.A. 1975, Ohio State University; M.D. 1979, Vanderbilt University

Donna Marie Venezia, *Assistant in Medicine*
B.S. 1975, Rensselaer Polytechnic Institute; M.D. 1979, Albany Medical College

Susan Thomas Verghese, *Assistant in Anesthesiology*
M.B., B.S. 1974, Christian Medical College, India

Genevieve Taylor Vershel, *Assistant in Radiology*
B.S. 1972, University of Maryland; M.D. 1976, University of Minnesota

Edward George Verville, *Assistant in Psychiatry*
B.S. 1957, St. Lawrence University; M.D. 1964, University of Miami

Steven J. Walerstein, *Assistant in Medicine*
B.S. 1976, Rensselaer Polytechnic Institute; M.D. 1979, Albany Medical College

Marilyn Mills Walkey, *Assistant in Radiology*
B.A. 1972, Pomona College; M.S. 1974, San Francisco State University; M.D. 1979, Albany Medical College

John Alan Walsh, *Assistant in Thoracic Surgery*
B.S. 1970, Villanova University; M.D. 1975, Albany Medical College

Steven L. Warsof, *Assistant in Obstetrics and Gynecology*
B.S. 1973, Massachusetts Institute of Technology; M.D. 1977, Yale University

Daniel R. Weinberger, *Assistant in Neurology*
B.A. 1969, Johns Hopkins University; M.D. 1973, University of Pennsylvania

Robert Steven White, *Assistant in Medicine*
B.S. 1974, University of Georgia; M.D. 1979, University of Louisville

John Franklin Williams, Jr., *Assistant in Anesthesiology*
A.B. 1970, Boston University; M.P.H. 1975, Yale University; M.D. 1979, George Washington University

Jeffrey Philip Winick, *Assistant in Ophthalmology*
B.A. 1975, Brandeis University; M.D. 1979, Cornell Medical College

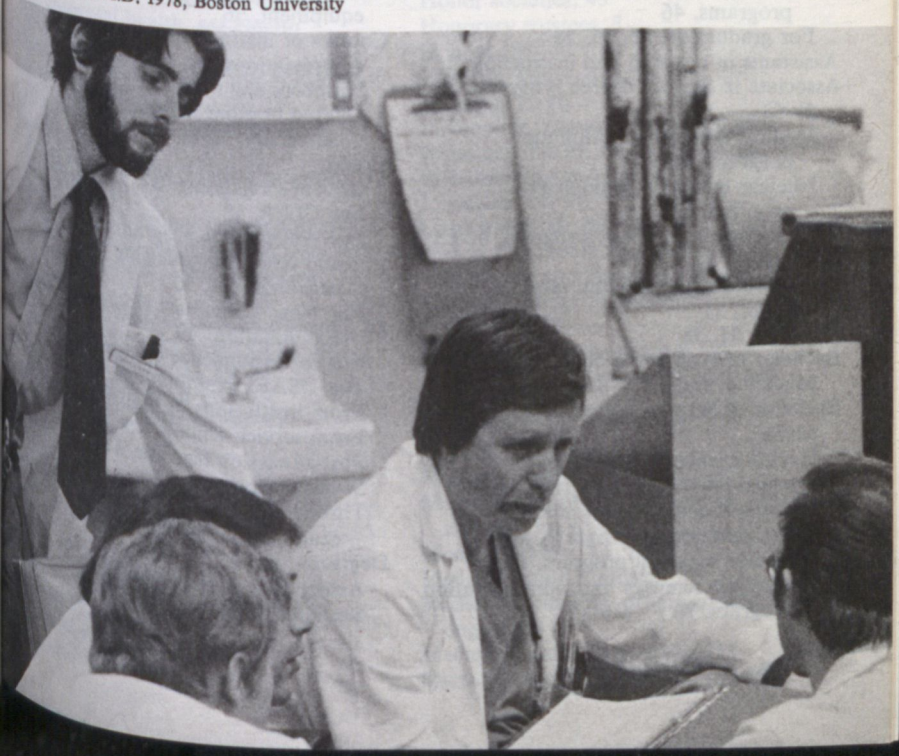
Bradley John Winston, *Assistant in Medicine*
B.A. 1972, Middlebury College; M.D. 1979, University of Pennsylvania

Monty Woods, *Assistant in Surgery*
B.A. 1966, Case Western Reserve University; M.D. 1970, Bowman-Gray School of Medicine

Mostafa Galal Zakaria, *Assistant in Anesthesiology*
M.B., Ch.B. 1975, Alexandria University, Egypt

Christopher Joseph Zielinski, *Assistant in Orthopaedic Surgery*
B.S. 1973, University of Notre Dame; M.D. 1977, George Washington University

Richard Alan Zirin, *Assistant in Medicine*
B.A. 1974, M.D. 1978, Boston University



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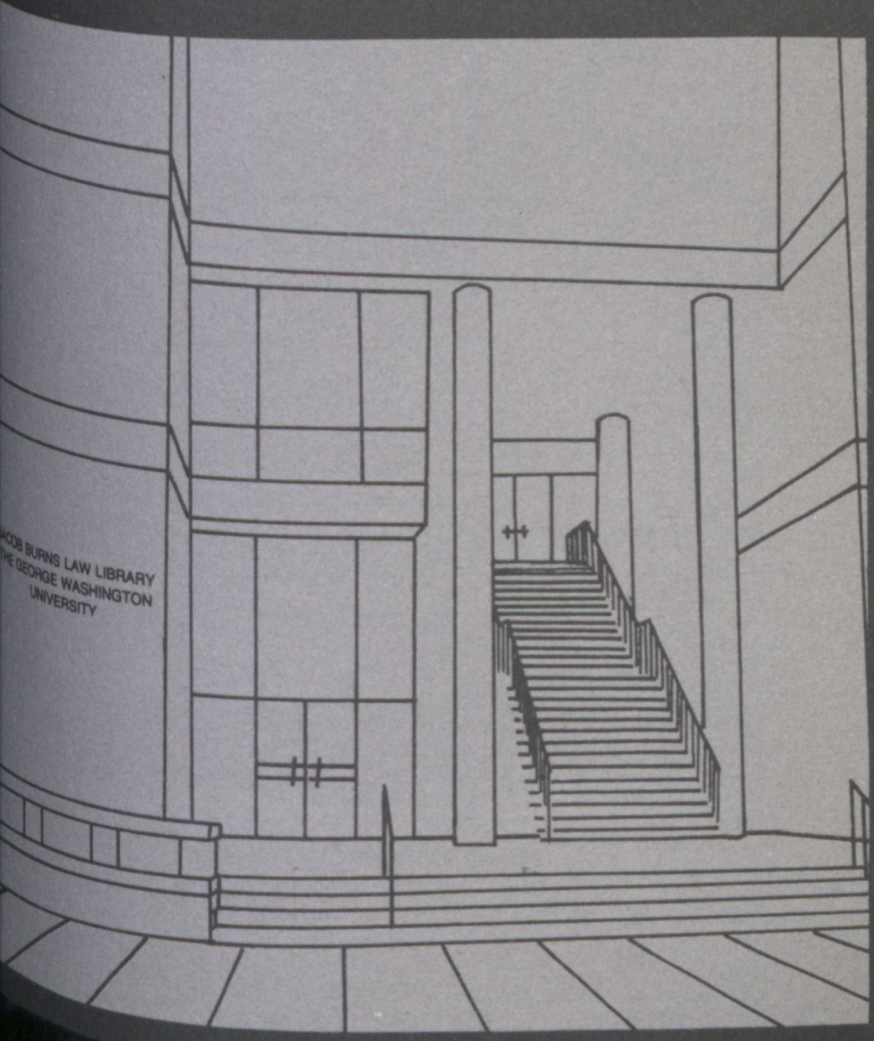

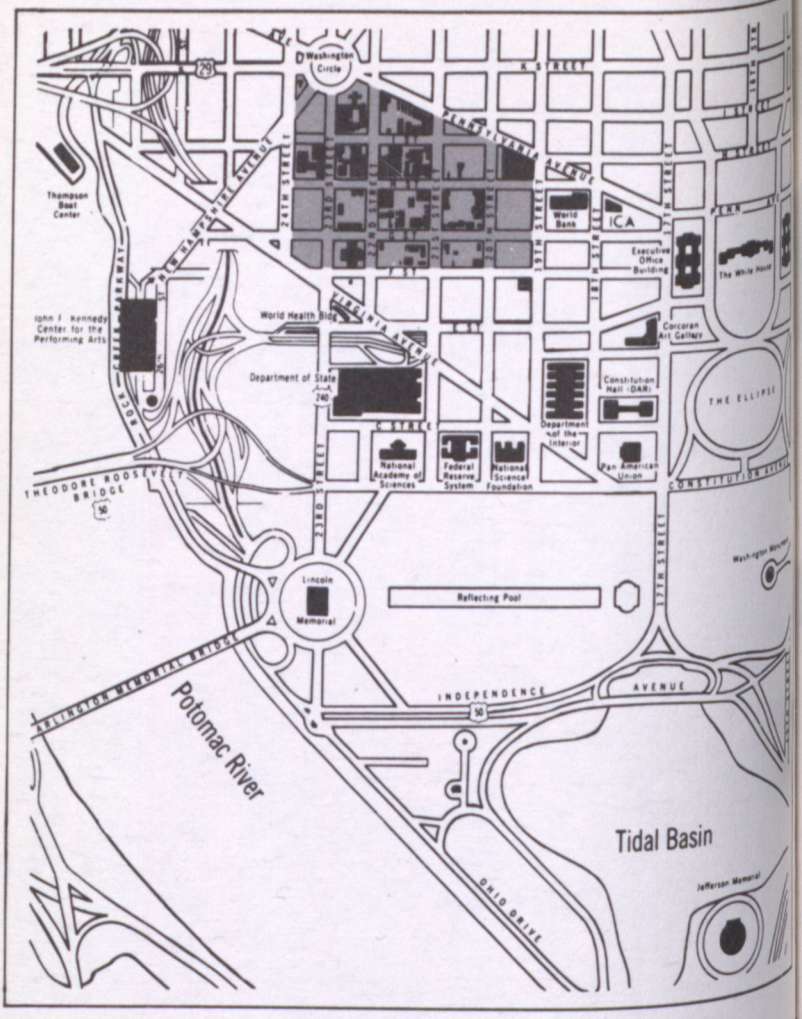

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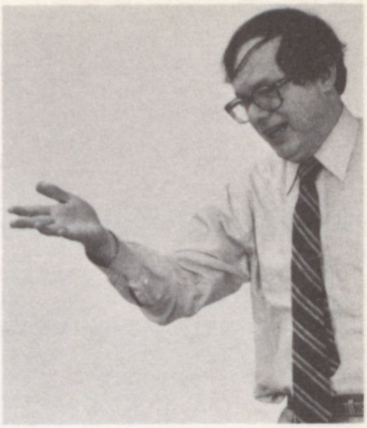

TO PROSPECTIVE STUDENTS.

This Bulletin of the George Washington University National Law Center contains general information about such matters as admission, registration, fees, and financial aid, as well as a listing of our faculty and courses of instruction. Our Bulletin requires considerable detail. We are one of the nation's large law schools. But, nonetheless, there always has been a tradition of friendliness among our students and an attitude of accessibility on the part of our faculty. If you are admitted to join us as first-year students, you will discover that the first-year life of the school is an intense one. Each of the sections into which the first-year class is divided becomes a little community of its own with a camaraderie and esprit de corps which will make that first year one of the most memorable of your lives.

The National Law Center is an institution which is characterized by the richness and diversity of its programs. Whether you are joining us as a J.D. student or an LL.M. student, your time here will be one of intellectual growth. In your upper-class years, you may choose to take one of the many courses and programs in fields such as Constitutional Rights, Administrative Law, Environmental Law, Government Contracts, International Law, Labor Law and Antitrust Law, Land Development Law, Patent Law, or Taxation, which have given this school its reputation as a center for study and research in public law. If you come to us as a graduate student you may choose to specialize in one of the areas just mentioned. As J.D. students in your upper-class years, you might also choose to direct your energies to the School's varied and intense programs in Clinical Law, ranging from clinics in problem areas as important, but yet as diverse, as Immigration and Bankruptcy. Whatever direction you choose to follow during your years here, we believe that you will find your time here stimulating, productive, and forever valuable. When you graduate, you will join a body of alumni among whose numbers are U.S. Senators and Congressmen, Federal and State Judges, State Governors and Legislators, high government officials, and leaders of the bar in every state. The National Law Center is a large law school, but we believe it is a community. We hope that you will aspire to join us and to become a part of that community.

Jerome A Barron

Jerome A. Barron
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THE CALENDAR 1981–1982*

JUNE 1981

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FEBRUARY 1982

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1981 SUMMER TERM

May 26 Registration for all sessions *Tuesday* (noon–6:30 p.m.)
Application for September 30 graduation due as part of registration

May 27 First-session and 13-week session classes begin *Wednesday*

July 3 Holiday *Friday*

July 6 First-session classes end *Monday*

July 7, 8, 9 First-session examination period *Tuesday-Thursday*

July 10 Registration (9:30 a.m.–2 p.m. and 4–6 p.m.) and first day of classes, second session *Friday*
Application for September 30 graduation due as part of registration

August 18 Last day of classes *Tuesday*

August 19, 20, 21 Second-session and 13-week session examination period *Thursday-Friday*

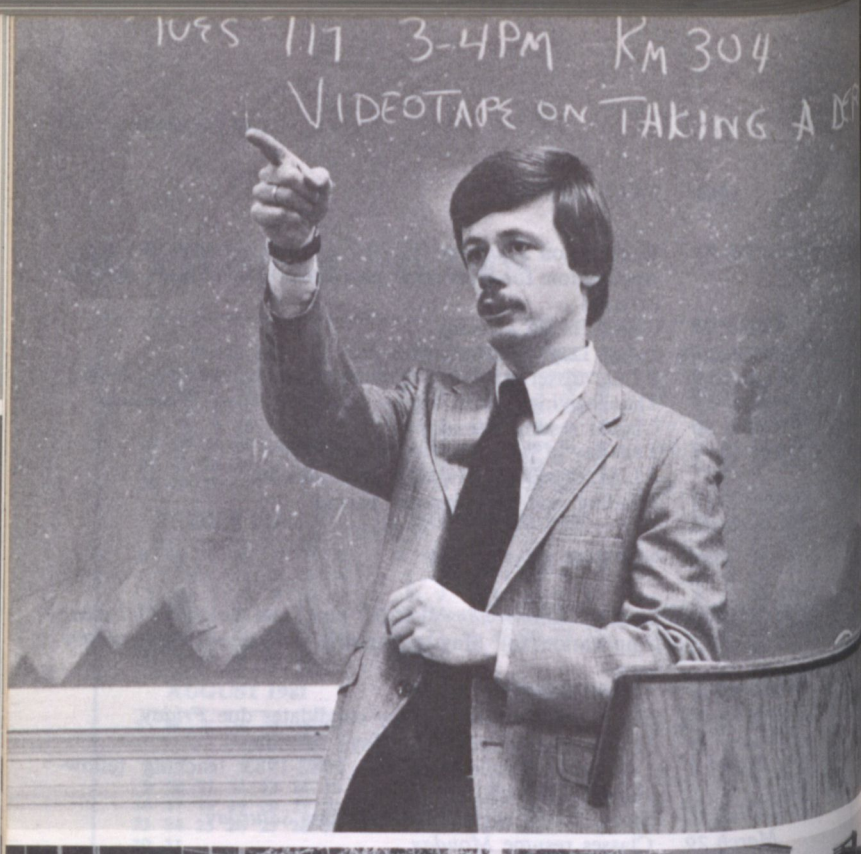
* This calendar is subject to change.

1981 FALL SEMESTER

August 20–21	Registration *Thursday* (12:30-7 p.m.) and *Friday* (3-7 p.m.) Application for February graduation due as part of registration
August 24	Classes begin *Monday*
September 7	Labor Day (holiday) *Monday*
October 9	S.J.D. dissertations of February candidates due *Friday*
November 25	Thanksgiving recess begins after last class *Wednesday*
November 30	Classes resume *Monday*
December 4	Last day of fall-semester classes *Friday* LL.M. theses of February candidates due
December 5–18	Reading and examination period

1982 SPRING SEMESTER

January 11–12	Registration *Monday* (12:30-7 p.m.) and *Tuesday* (3-7 p.m.) Application for May graduation due as part of registration
January 13	Classes begin *Wednesday*
January 29	S.J.D. dissertations of May candidates due *Friday*
February 15	Winter Convocation (holiday) *Monday*
March 1	Completed applications for 1982-1983 teaching fellowships due *Monday*
March 20	Spring recess begins after last class *Saturday*
March 29	Classes resume *Monday*
May 3	Last day of spring-semester classes *Monday* LL.M. theses of May candidates due
May 4–May 17	Reading and examination period
May 23	Commencement *Sunday*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THE NATIONAL LAW CENTER

HISTORY

THE LAW CENTER, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend George Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty which reflected the fact that it was at the seat of our nation's government. Associate Justices David J. Brewer and John Marshall Harlan of the Supreme Court of the United States were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American Practice) in 1951.

In 1954, National University School of Law, which had an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. At present these include Taxation; Labor Law; Environmental Law; Patent Law; International and Comparative Law; and Government Contracts. The academic courses reflect the breadth in public law for which the Law Center is well known.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. A clinical law program has been developed which is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the Community Legal Clinic, Students in Court, and individual projects supervised by the Law Students Civil Rights Research Council.

Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, taxation and government contracts, has developed a rich selection of courses, traditional and clinical, oriented toward the needs of the poor, the elderly, and the consumer.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in the nation's capital, the focal point of the law in action, both American and international. The work of the Center goes on in this environment, presenting a unique opportunity for observation and study of federal agencies—judicial, legislative, and administrative. Readily accessible are the Supreme Court of the United States, the federal trial and appellate courts of the District of Columbia and, in addition, federal courts of special jurisdiction, such as the United States Court of Claims, the United States Court of Customs and Patent Appeals, the United States Tax Court, and the Court of Military Appeals. Current federal legislation can be studied as it is considered by Congressional committees and as it comes up for debate on the floors of the House of Representatives and the Senate. With respect to the federal administrative agencies, students here in Washington have matchless opportunities for study and observation. They can attend informal and formal hearings of these agencies and can obtain from the docket sections complete records of administrative adjudications in specific cases. Illustrative of such federal agencies are the Interstate Commerce Commission and the Civil Aeronautics Board in the field of transportation; the Federal Trade Commission in the field of trade regulation; the Securities and Exchange Commission in the field of security issues and corporate finance; the National Labor Relations Board in the field of labor-management relations; the United States Patent Office in the field of patent law; the Federal Power Commission in the field of water, natural gas, and electric power; and the Federal Communications Commission in the field of radio and television.

Supplementing these environmental advantages of law in action are the exceptional research library collections in the Library of Congress, in the various departments of the federal government, and in the libraries of the headquarters of national and international organizations. The notable library of the Carnegie Foundation for International Peace has been acquired by George Washington University for use of research students in international and comparative law, fields with respect to which Washington has come to be called "The Capital of the World."

The years of residence at law school are years of participation in the life of the community, which in the case of the George Washington University National Law Center is the government of the United States. As a consequence

the study of law takes on added meaning, whether the goal be government service or practice, general or specialized, and whatever the community in which the student plans to practice.

ENRICHMENT PROGRAM

The Law Center supplements and enriches its diverse law programs by bringing to the school eminent legal scholars, judges, distinguished members of the bar, members of Congress, and high-level government officials to offer lectures and informal seminars with students and faculty. Last year participants in the enrichment program included: Fred Graham, CBS Legal Correspondent; Constitutional law scholar John Hart Ely; Charles Renfrew, former U.S. District Judge and Deputy Attorney General of the United States; and Irving Pollack, former Securities and Exchange Commissioner. The enrichment program, funded largely by gifts from alumni and friends of the Law Center, includes several endowed lectureships and a visiting scholar program.

OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law and to encourage scholarly research and writing in the law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors; (2) an extensive clinical law program in which students learn legal skills by actual practice; (3) two law journals which specialize in public law and international law; (4) trial practice; (5) participation in the Van Vleck Appellate Case Club, and several other moot court competitions; (6) a series of student professional co-curricular activities; (7) studies on an advanced level for foreign as well as for American students; (8) a continuing legal education program for members of the bar providing them with opportunities for course work within the curriculum; and (9) scholarly research and writing in the law.

THE NATIONAL LAW CENTER COMPLEX

The National Law Center Complex consists of three buildings: Stockton Hall, Bacon Hall, and the Jacob Burns Law Library.

Stockton Hall

Stockton Hall is the main classroom building. It also holds faculty offices and the offices of the Dean and the Associate Deans of the Law Center, as well as the Records Office and student lounges.

Bacon Hall

Bacon Hall houses faculty offices; student lounges; the *George Washington Law Review* Office; the Government Contracts Program; the Admissions Office; the Law Center Placement Office; the offices of the *Journal of Interna-*

tional Law and Economics; the Black American Law Student Association; th
Law Students Civil Rights Research Council; the Van Vleck Appellate Cas
Club; the *Advocate,* the law school newspaper; the Student Bar Association; th
Consumer Protection Center; the Community Legal Clinic; and Movimient
Legal Latino, the national Latino law students association.

The Jacob Burns Law Library

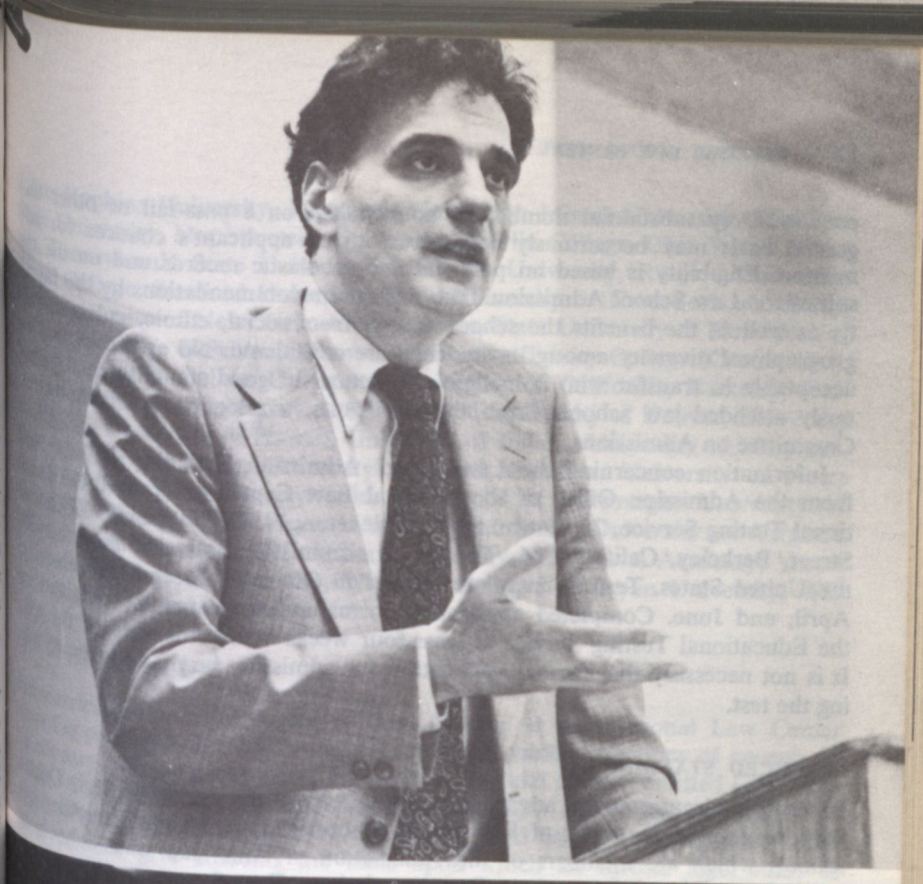
The Law Library of more than 255,000 volumes, including microfil
holdings, is housed in the modern Jacob Burns Law Library Building, adjoin
ing Stockton Hall on the south side. This facility comprises nine floor and dec
levels with about 49,000 square feet of floor space. Its shelf capacity accom
modates over 185,000 volumes; with supplementary shelving in Stockton Hall
a small branch of the Law Library for the use of the *Law Review* in Baco
Hall, and substantial storage space in Lisner Hall, the library provides spac
for approximately 300,000 volumes. Seating for more than 500 readers i
provided in four reading rooms, lounge areas, carrels, enclosed study cubicles
semi-private reading alcoves, and seminar rooms.

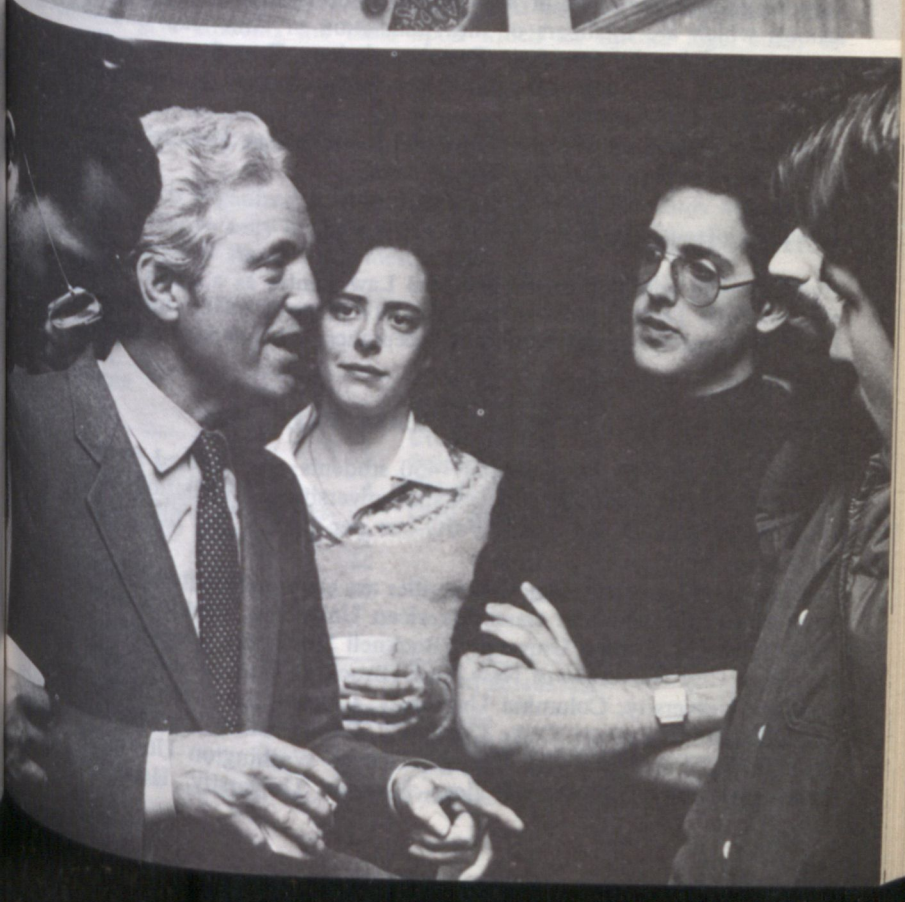
The collections comprise a comprehensive working library of Anglo-Amer
can law, with supplementary material in related disciplines (such as business
finance, labor relations, sociology, criminology, political science, biography
foreign affairs, and others). Special areas are maintained for collections in ta
law, labor law, patent-trademark-copyright law, international law, and foreig
and comparative law. Included in the collections are the appellate decisions o
all states courts and decisions of the federal courts, with comprehensive collec
tions of English and Canadian court decisions; the currently annotated statute
of the 50 states; all federal statutes; English and Canadian statutes; selected
statutes of other nations; and an extensive periodical collection, kept current by
approximately 1,400 subscriptions, covering virtually all American legal period
cals and most of those published in English throughout the world. The library is
strong in its treatise holdings, administrative and regulatory materials, and Con
gressional coverage. The growing international law holdings include collection
of United Nations and European Economic Community printed material, al
recent material from the International Labor Organization, and current and
retrospective collections of international treaties. A large portion of the hold
ings of the former library of the Carnegie Endowment for International Peace
acquired by the University in 1950, is in the Law Library. A LEXIS terminal,
providing computer-assisted research capability, is available to students and
faculty. The Law Library is in the process of enlarging its videotape library to
assist in Law Center instruction.

The Juris Doctor Degree Program

ENTRANCE REQUIREMENTS

For information on "Application for Admission" to the Juris Doctor degree
program, see page 28. Admission to candidacy for the degree of Juris Doctor
requires a Bachelor of Arts or equivalent degree from an accredited college or
university, a satisfactory quality of work, and an acceptable distribution of





courses. Any substantial number of hours taken on a pass-fail or other ungraded basis may be seriously detrimental to an applicant's chances for admission. Eligibility is based on personal and scholastic records and on the result of the Law School Admission Test. Personal recommendations by the faculty, as well as the benefits the school derives from social, ethnic, cultural, and geographical diversity among its students, are considered. No applicant will be acceptable in transfer who is ineligible to return in good standing to a previously attended law school. From the applicants, a selection is made by the Committee on Admissions.

Information concerning the Law School Admission Test may be obtained from the Admission Office of the National Law Center or from the Educational Testing Service, 20 Nassau Street, Princeton, N.J. 08540; or 1947 Center Street, Berkeley, Calif. 94704. The test is administered at various centers in the United States. Testing dates are usually in October, December, February, April, and June. Completed application forms and fees must be received by the Educational Testing Service at least four weeks before the date of the test. It is not necessary that formal application for admission be made prior to taking the test.

ADVANCED STANDING

In unusual circumstances, advanced standing toward the degree of Juris Doctor may be granted for work of high quality successfully completed in other law schools which are members of the Association of American Law Schools or are approved by the American Bar Association. Transferred credits will not be recognized in excess of those which might be earned in a similar period in the National Law Center.

Advanced standing will not be granted for law work already counted toward the Bachelor of Arts or other pre-legal degree.

TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for the degree of Juris Doctor must submit a tuition deposit ($100 initially plus $350 later) after receipt of notification of acceptance. This deposit is credited toward tuition.

PROFILE OF THE ENTERING CLASS, FALL 1980

A first-year class of approximately 450 students was selected from more than 5,000 applicants from 730 colleges and universities. Applications were received from every state in the union. Forty-one per cent of the first-year class were women.

The following colleges and universities are each represented by three or more members of the first-year class: American University, Boston University, Brandeis University, Brown University, Bucknell University, Catholic University of America, City University of New York (Brooklyn College and Queens College), Colgate University, Columbia University, Cornell University, Dartmouth College, Dickinson College, Duke University, Emory University, Fordham University, Franklin and Marshall College, George Washington University, Georgetown University, Hamilton College, Harvard University, Haverford College,

Johns Hopkins University, Marquette University, Miami University, Michigan State University, Northwestern University, Oberlin College, Ohio State University, Pennsylvania State University, Princeton University, Rutgers University, Smith College, Stanford University, State University of New York at Albany, State University of New York at Binghamton, State University of New York at Buffalo, Syracuse University, Temple University, Trinity College (Connecticut), Tufts University, Tulane University, University of California, Berkeley, University of Chicago, University of Connecticut, University of Denver, University of Florida, University of Hawaii, University of Illinois, University of Maryland, University of Michigan, University of North Carolina, University of Notre Dame, University of Pennsylvania, University of Pittsburgh, University of Rochester, University of Texas, University of Utah, University of Virginia, University of Wisconsin, U.S. Military Academy, U.S. Naval Academy, Vassar College, Washington University, Wellesley College, Wesleyan University, Williams College, Yale University.

THE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center offers the candidate one of the largest and most varied selections of courses in the country. First-year students are required to take courses entitled Civil Procedure; Constitutional Law; Contracts; Criminal Law and Procedure; Legal Research, Writing, and Professional Responsibility and Ethics; Property; and Torts. These courses give students the basis upon which all further legal study is built. In the second and third years of study, students must take Evidence and fulfill a two-credit legal writing requirement. Beyond these requirements the students are free to choose from the many course and project offerings. The Law Center prides itself on allowing students freedom to design their own program of study.

The curriculum is organized so that students may begin the study of law for the Juris Doctor degree only at the start of the fall semester. Transfer students may enter at the start of the spring semester also.

Day Division

First Year

FALL SEMESTER		SPRING SEMESTER	
Contracts I	4	Contracts II	2
Torts	4	Property	4
Criminal Law and Procedure	4	Constitutional Law	4
Legal Research, Writing, and Professional Responsibility and Ethics	2	Civil Procedure	4
Total semester hours	14	Total semester hours	14

Second Year

FALL SEMESTER		SPRING SEMESTER	
Elective	14	Evidence	4
		Elective	10
Total semester hours	14	Total semester hours	14

Third Year

FALL SEMESTER		SPRING SEMESTER	
Elective	12	Elective	14
*Legal writing requirement	2		
Total semester hours	14	Total semester hours	14

Evening Division

First Year

FALL SEMESTER		SPRING SEMESTER	
Contracts I	4	Contracts II	4
Torts	4	Criminal Law and Procedure	4
Legal Research, Writing, and Professional Responsibility and Ethics	2	Civil Procedure	2
Total semester hours	10	Total semester hours	10

Second Year

FALL SEMESTER		SPRING SEMESTER	
Property	4	Constitutional Law	4
Elective	6	Elective	6
Total semester hours	10	Total semester hours	10

Third Year

FALL SEMESTER		SPRING SEMESTER	
Elective	8	Evidence	4
*Legal writing requirement	2	Elective	6
Total semester hours	10	Total semester hours	10

Fourth Year

FALL SEMESTER		SPRING SEMESTER	
Elective	10	Elective	10
Total semester hours	10	Total semester hours	10

Summer Term or Ninth Semester

Elective	4

*This requirement may be satisfied by service on the *Law Review*, by service as an editor of the *Journal of International Law and Economics*, by satisfactory completion of a seminar and other courses which require a research paper, by participation in upper class Moot Court, or by satisfactory completion of Law 344, *Legal Writing*.

REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academic years (four years for evening students) and 84 semester hours of required and elective courses, with a cumulative average of at least 65. At least one academic year of residence and 28 semester hours are required of students admitted with advanced standing. The work of the final semester or summer session must be completed while in residence at the National Law Center. Credits allowed for advanced standing are not included in computing the average required for graduation.

Graduation Requirements.—See pages 41–42 for a statement of the graduation requirements.

Residence

Candidates for the Juris Doctor degree must complete a residence period of three academic years. Attendance in the day division for the fall and spring semesters constitutes residence for an academic year; similar attendance in the evening division constitutes residence for three-fourths of an academic year. Consequently, a day student must attend six semesters to meet residence requirements; an evening student must attend eight. Students authorized to take schedules of less than 10 hours in the day division or less than six hours in the evening division receive residence credit on a proportional basis. Students who attend the summer sessions receive fractional residence credit.

HONORS

The degree of Juris Doctor "With Highest Honors" is awarded to those students, not exceeding three per cent of the graduating class, who have obtained the highest cumulative averages of at least 85 or better.

The degree of Juris Doctor "With High Honors" is awarded to those students with the highest cumulative averages of 80 or better. The number of students receiving degrees "With High Honors," when added to the total number of students receiving degrees "With Highest Honors," may not exceed 10 per cent of the graduating class.

The degree of Juris Doctor "With Honors" is awarded to those students with the highest cumulative averages of 75 or better. The number of students receiving degrees "With Honors," when added to the total number of students receiving degrees "With High Honors," and "With Highest Honors," may not exceed 40 per cent of the graduating class.

ORDER OF THE COIF

The Order of the Coif, a national legal honor society, aims "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." The George Washington University Chapter was established in 1926. Members are elected each year from the highest-ranking 10 per cent of the graduating Juris Doctor candidates. Only students who have completed their full course of study at the National Law Center are eligible for membership.

PUBLICATIONS

The *George Washington Law Review*, published five times a year, is edited and managed by the students of the National Law Center. The *Law Review* is known for its emphasis on federal and public law; however, it is also devoted to research in other important legal areas. The staff of the *Law Review* is selected on the basis of a writing competition and on the basis of grades. The editorial board is selected from those students who have successfully completed the first year of *Review* work. Students receive 4 semester hours of academic credit for the two-year program.

The *Journal of International Law and Economics*, managed and edited by law students, is a publication of the Law Center. It presents articles and commentaries on public and private international financial development, comparative law, and international law. The staff of the *Journal* is selected on the basis of grades and a writing competition, and students earn academic credit for their work.

MOOT COURT

The moot court competitions provide realistic training in appellate oral advocacy for students in the National Law Center. The Van Vleck Appellate Moot Court Board holds an upper-class competition in the fall and a first-year competition in the spring. There are also moot court competitions in specific areas of the law, including the Jessup International Law Moot Court, the Patent Law Moot Court, and the Wagner Labor Law Moot Court.

LAW CENTER ORGANIZATIONS

The Advocate

The Advocate is the student newspaper of the National Law Center. It features articles by faculty and students on school news and current legal topics.

Black American Law Student Association (BALSA)

The Black American Law Student Association is a national Black law student organization which has chapters at some 80 law schools. BALSA sponsors law speakers and various programs.

International Law Society

The International Law Society is an organization of students interested in the practice of international law. The Society sponsors speakers and various programs.

Movimiento Legal Latino

A national Latino law students organization which has chapters at various law schools, Movimiento Legal Latino sponsors law speakers and various programs.

Law Fraternities and Sororities

The chapters of Beta Kappa Pi, Delta Theta Phi, Phi Alpha Delta, and Phi Delta Phi at the National Law Center sponsor speakers and various social occasions.

Law Students Civil Rights Research Council (LSCRRC)

The Law Students Civil Rights Research Council is a national organization of law students concerned with the legal problems of civil rights. LSCRRC offers clinical law projects for which students may receive academic credit.

National Lawyers Guild

The George Washington Chapter of the National Lawyers Guild is designed to bring together those lawyers committed to broad issues of social reform.

Student Bar Association

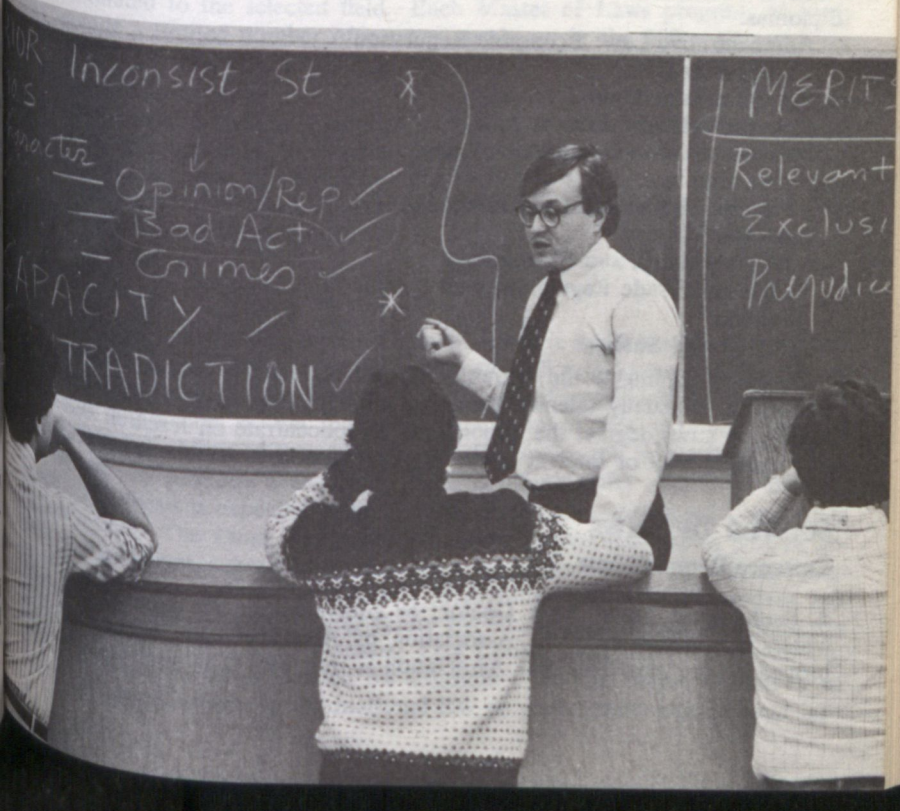
The Student Bar Association is the law student governing body, responsible for allocating funds among the various student organizations. It also conducts a speaker program for the law school. All members of the student body are members of the Student Bar Association.

Student Intellectual Property Law Association

The Student Intellectual Property Law Association, an organization of students interested in patent, trademark, copyright, and related law, conducts an extensive speakers program as well as various social events.

Women's Rights Committee (WRC)

The Women's Rights Committee is primarily interested in the place of women in law schools and in the legal profession. WRC conducts seminars and sponsors speakers.



Joint Juris Doctor–Master's Degree Program

In certain instances, arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a Master's degree in some fields in the University's Graduate School of Arts and Sciences, School of Government and Business Administration, or School of Public and International Affairs. Fields in which this program is available include Business Administration, Economics, International Affairs, Political Science, Public Administration, and Public Affairs. Students must be admitted both to the National Law Center and, separately, to the School which will confer the Master's degree, and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Master's and Doctoral Programs

The administration of justice under law is a matter so vast and complex that some who hold the Bachelor of Laws or Juris Doctor degree feel the need for further study. The Master's and doctoral programs give students the opportunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general study or concentrate in one of the specialized areas listed below. Courses in each of these areas are included in the 401–600 series. Graduates who complete their work in one of these areas may have the field of specialization noted on their diplomas.

Administrative Law: Economic Regulation
Corporation Law
Environmental Law
Government Procurement Law
International and Comparative Law
Labor Law
Land Use Management and Control
Law and Poverty
Law, Psychiatry, and Criminology
Patent and Trade Regulation Law
Taxation
Urban Legal Studies

Programs leading to the degree of Doctor of Juridical Science offer a limited number of unusually talented advanced students, who have already earned the Master of Laws degree, the opportunity to concentrate on research and writing in a specific area of interest to the legal profession.

MASTER OF LAWS

Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law school which is a member of the Association of American Law Schools or is approved by the American Bar Association is required. The applicant must have

demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

Degree Requirements

The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either *CR* (Credit) or *NC* (No Credit) is assigned. To receive the grade of *CR* (Credit) in a course taken in other graduate divisions of this University, a student is required to attain the grade of *B* or better. To receive the grade of *CR* (Credit) in a course taken at Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of *C* or better. A minimum cumulative average of 78 is required at all times for all LL.M. candidates. The student is expected to include Law 599–600 *Thesis* in the 24-semester-hour requirement for the degree (for exception, see "Master's Thesis," below).

Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field. Each Master of Laws program of study may include a limited number of courses numbered in the 300 series, with the approval of the Dean.

The only credit hours that may be applied to any Post-J.D. degree are those completed while a duly enrolled candidate for that specific degree, with the following exceptions: (1) an unclassified student who has been admitted with the specific right to convert to degree status at the end of a specified number of hours, and (2) S.J.D. candidates who have fulfilled the 8-hour course requirement as unclassified students.

MASTER'S THESIS

Each candidate for the degree of Master of Laws is expected to write a Master's thesis (Law 599–600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for successful completion of the thesis. The purpose of this requirement is to demonstrate the ability of the student to perform research in a special area of the law and to produce a scholarly paper containing the results of this research. The thesis is expected to be of substantially the same quality as a Law Review article. The Dean may waive the thesis requirement upon written request of the student, submitted no later than the beginning of the *final semester or summer session* before the student's graduation, provided the student has demonstrated research and writing ability by taking a minimum of 6 semester hours of course work at the National Law Center designated "Research Paper." No thesis waiver is granted for candidates for the degree of Master of Laws with specializations in international law or government procurement law.

The thesis in its final form must be presented to the adviser no later than the date specified in the Calendar. Two complete copies are required. It is the responsibility of the candidate to obtain from the Post-J.D. Programs Office a printed copy of the regulations governing the styling and reproduction of theses. The mandatory thesis binding fee of $15 must be paid at the time of registration for the last semester's work.

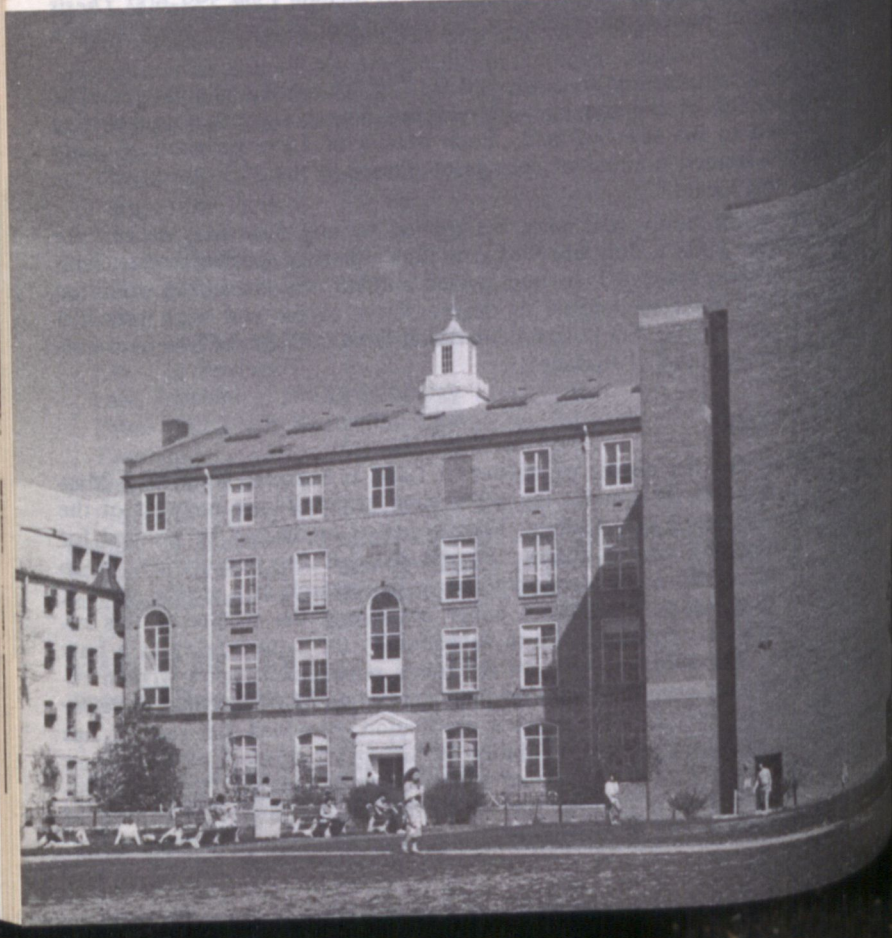
Accepted theses become the property of the University and are placed in the University Library and the Law Library, where the duplicate copies are bound and made available for circulation.

Honors

The degree of Master of Laws "With Highest Honors" is awarded students who obtain a minimum cumulative average of 85.

Graduate Courses in Other Departments

Master of Laws candidates may be permitted to take graduate courses related to their fields of interest in other departments of this University. A maximum of 6 semester hours will be credited toward the degree for such courses; however,



credit will be granted only if the courses are given on campus. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. Courses numbered 101–200 may be taken for graduate credit only if the student receives the approval of the instructor at the time of registration and does additional work, as prescribed by the department offering the course.

Consortium of Universities of the Washington Metropolitan Area, Inc.

A candidate for the Master of Laws degree may take graduate courses at Georgetown University Law Center through the Consortium of Universities of the Washington Metropolitan Area, Inc. A maximum of 6 semester hours of such courses may be credited toward the degree. Permission to take Consortium courses must be granted by the Dean, the Registrar, and the instructor offering the course. The grade of *CR* (Credit) or *NC* (No Credit) will be recorded for such courses. To receive the grade of *CR* a student must attain a grade of *C* or higher.

DOCTOR OF JURIDICAL SCIENCE

Entrance Requirements

Admission to candidacy for the degree of Doctor of Juridical Science requires a Bachelor of Arts or equivalent degree from an approved college or university; a Bachelor of Laws, Juris Doctor, or equivalent degree, earned with high rank, from a law school which is a member of the Association of American Law Schools or is approved by the American Bar Association; a Master of Laws degree with high academic standing; outstanding capacity for scholarly work in the field of law; and faculty approval of the applicant's dissertation topic. Applicants must also demonstrate their writing ability by submitting the Master's thesis or a copy of one or more papers or articles which the applicant has written. Following consultation with the Dean, the applicant must obtain a faculty adviser, to be designated "committee chairman," from the regular, full-time faculty; reach agreement on the acceptability of the proposed topic for the dissertation; and submit a detailed outline for the adviser's approval, indicating by chapter and division within chapter the exact scope of the project. There should be a bibliography for each chapter, listing books, reports, cases, and law review articles to be considered. Although the outline cannot predict every detail of the subsequent research, it must be sufficiently definite to afford the Graduate Board a basis for evaluation.

Once the outline is approved, the applicant's "committee" is expanded to three members; this consultative committee must recommend the acceptance of the applicant to the full Graduate Board. The Board then acts upon the recommendation and may either accept or reject the applicant as an S.J.D. candidate. In no instance will any applicant be admitted to degree candidacy prior to the above procedures; however, the applicant may be registered as an Unclassified Student for purposes of course work requirements (see below). Approval for degree candidacy must be received within one year of the appointment of an adviser unless a written extension is granted by the Dean.

Degree Requirements

The candidate must complete (1) a residence period of not less than one academic year; (2) a course of study and research—designated by the consulta-

tive committee and approved by the Graduate Board—of no less than 8 semester hours including *Jurisprudence,* unless previously taken; and (3) an acceptable dissertation. The dissertation must be submitted no later than three years from the date of admission to candidacy for the S.J.D. degree. The applicant who proposes to write on a comparative law topic must have a reading knowledge of the language in which the relevant materials are to be found. When the dissertation is submitted, the consultative committee will set the date for an oral examination. This examination is conducted by the consultative committee and such other members of the faculty and qualified experts as are selected by the Graduate Board.

No later than the date specified in the Calendar (see page 5), the candidate must submit to the Dean two complete copies of the dissertation and two copies of an abstract (not to exceed 600 words) of his dissertation.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation and preparation of the abstract are available in the Office of the Dean. To be acceptable the dissertation must, in the opinion of the examining committee, constitute a substantial contribution to the field of law concerned and be suitable for publication. Additional information will be supplied by the Dean. Accepted dissertations become the property of the University and are placed in the University Library and the Law Library, where the duplicate copies are bound and made available for circulation.

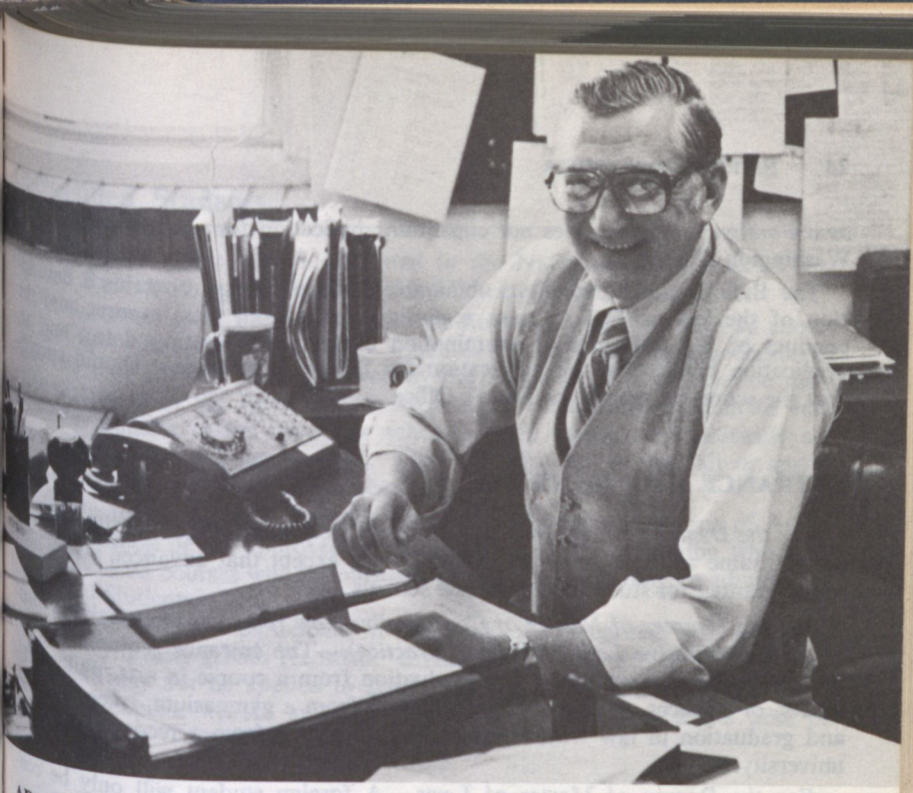
Degree Programs for International Students

The National Law Center has several programs of study available to students trained in law outside the United States. These programs fall into two general categories: (1) those directed toward preparing students for a bar examination in an American jurisdiction and (2) those that enable students to return to their countries with a more thorough understanding of some aspects of American law.

A student with a degree from a foreign law school who has met the extremely competitive admissions criteria will be admitted to the Center as a candidate for the Master of Comparative Law (Foreign Practice) (M.Comp.L. [For. Prac.]) or Master of Comparative Law (American Practice) (M.Comp.L. [Am. Prac.]) degree.

To prepare for admission to the bar of an American jurisdiction, the student may apply for either the Juris Doctor or the Master of Comparative Law (American Practice) degree. The J.D. degree requires 84 semester hours of work in law school (credit is given for work in a foreign law school only in exceptional circumstances) and will qualify the student to take most U.S. bar examinations. The M.Comp.L.(Am.Prac.) degree requires 32 semester hours of work and satisfies the requirements of the District of Columbia Bar. *Students are cautioned to ascertain the requirements of the bar for which they intend to qualify prior to selection of their law school programs.*

Foreign students planning to return to their home countries may undertake a program leading to the degree of Master of Comparative Law (Foreign Practice). This degree program enables the student to gain a broader comprehension of the American legal system by taking basic courses in the Law Center. However, it is not intended to qualify a student to take a U.S. bar examination.



ADMISSION PROCEDURE

Application must be received from *foreign applicants* no later than June 1 for the fall semester (March 1 for candidates for the Juris Doctor degree), November 1 for the spring semester, and March 1 for the summer sessions.

Required Records

Applicants must request all educational institutions attended to send directly to the Dean official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended are required, but in exceptional cases certified copies will be accepted. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 550 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08540, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English*

as a Foreign Language does *not* constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Dean's Office.

ENTRANCE REQUIREMENTS

For the Degree of Juris Doctor.—Entrance requirements for foreign students are the same as those stated on pages 10–12, except that advanced standing is rarely granted for study in foreign law schools.

For the Degrees of Master of Comparative Law (Foreign Practice) and Master of Comparative Law (American Practice).—The entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycee, or liceo, and graduation in law with high academic standing from a recognized foreign university.

For the Degree of Master of Laws.—A foreign student will only be considered for admission to the Master of Laws program if he or she has a juris doctor or post-juris doctor degree in law with high academic standing from an American university.

For the Degree of Doctor of Juridical Science.—The usual entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycee, or liceo; graduation in law from a recognized foreign university; outstanding capacity for scholarly work in the field of law; and a Master of Laws degree with high academic standing from an American university.

DEGREE REQUIREMENTS

Juris Doctor, Master of Laws, Masters of Comparative Law, and *Doctor of Juridical Science.*—Degree requirements for foreign students are the same as those stated on pages 15, 19–20, and 21–22.

Master of Comparative Law (Foreign Practice).—The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in a period not exceeding three years from the time of registration for the degree. The student must complete satisfactorily 24 semester hours of approved courses of the Center, or of such other departments of the University as the faculty of the Center shall approve, and must maintain a cumulative average of at least 65.

Master of Comparative Law (American Practice).—The requirements for this degree are the same as those for the degree of Master of Comparative Law (Foreign Practice) except that this degree requires 28 semester hours of course work with a cumulative average of at least 65. For those students admitted for or after the 1979 Fall semester, 32 semester hours of course work with a cumulative average of at least 65 will be required.

Unclassified Students

Two types of students may be admitted to the National Law Center as Unclassified Students, in accordance with the following regulations:

1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above-average record at another law school which is a member of the Association of American Law Schools or is approved by the American Bar Association may, at the discretion of the Dean, be admitted as an Unclassified Student to earn credits for transfer to the other law schools. Such students are normally admitted only to the summer sessions. They are admitted to the fall or spring semester only in unusual circumstances.

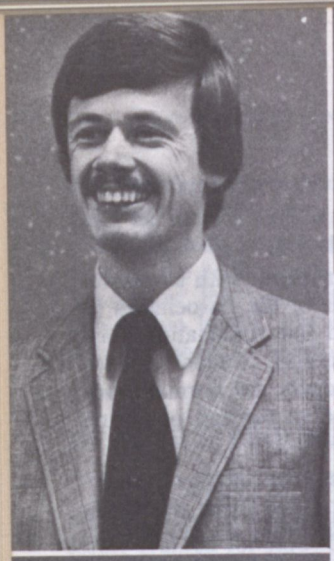
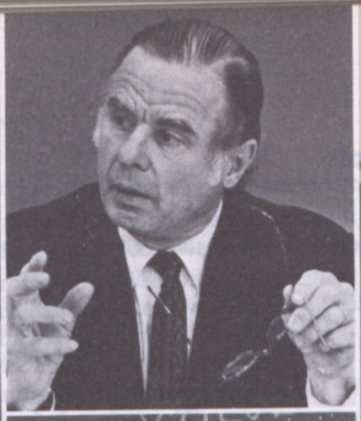
2. Graduates of law schools which are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as Unclassified Students.

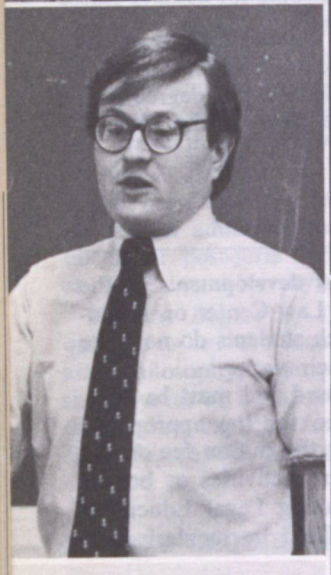
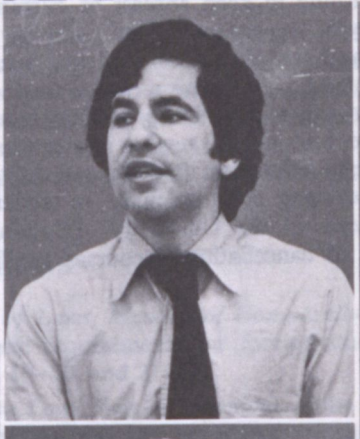
Unclassified Students participate in the work of the course, take examinations, and have their grades recorded. Credit for work earned as an Unclassified Student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

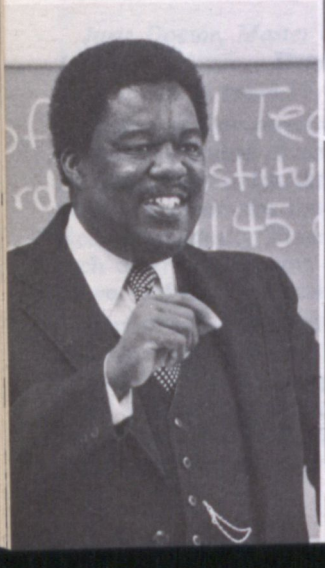
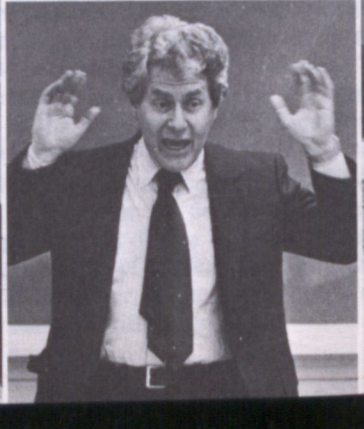
Continuing Legal Education

Members of the Bar wishing to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Such students do not take examinations in courses and no grades are recorded for their work.

A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. (Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.)

GENERAL INFORMATION

The National Law Center has an enrollment of about 1,700 for the J.D. and Post-J.D. degree programs. Approximately 1,000 students are enrolled in the full-time day division for the J.D. degree and 400 are enrolled in the part-time evening division. Three hundred students, many from abroad, are enrolled in the Post-J.D. degree programs.

DAY AND EVENING CLASSES

Day classes meet in the mornings in 50-minute periods and in the afternoons in 50-minute periods and also in sessions of two 50-minute periods, Monday through Friday. Trial Practice Court and certain other courses meet for two-hour periods on Saturday mornings.

Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday. A four-credit course, e.g., Evidence, meets two evenings a week; a three-credit course, e.g., Administrative Law, meets two evenings a week for one-half the semester and one evening for the other half; a two-credit course, e.g., Contracts II, meets one evening a week. The evening division conforms to the standards of the day division, the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be given in the evening.

SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summer. Students may register for either or both sessions. *No beginning students are admitted to the Juris Doctor program in the summer term.*

The summer term is shorter than a semester of the academic year, and, as a consequence, a student must attend two and one-half summer terms to receive residence credit for one academic year or attend one and one-half summer terms to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each session by day students. Day students receive four-tenths of a semester of residence credit for each session of the summer term in which they are registered for 3 or more semester hours. A maximum of 4 semester hours may be taken each session by evening students. Evening students receive three-tenths of a semester of residence credit for each session of the summer term in which they are registered for 2 or more semester hours.

Admission

Applicants are urged to submit application forms and complete credentials well in advance of the semester for which they seek admission. In the selection process, there is no discrimination against any applicant because of sex, race, color, religion, handicap, or national origin. An application fee of $30 for a degree candidate ($15 for an unclassified student) must accompany the application.

Forms for application for admission or readmission are available at and should be returned to the Office of Admissions of the National Law Center, George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institutions, see pages 22–24.

APPLICATION FOR ADMISSION

Juris Doctor Program.—Beginning students are admitted only at the start of the fall semester.

The applicant should register with the Law School Data Assembly Service (LSDAS) by completing and mailing the registration form supplied with each application blank. No application to this school will be processed unless accompanied by a Law School Application Matching Form, which is found in each applicant's LSAT/LSDAS registration packet. Since an LSAT and/or LSDAS report cannot be produced by Educational Testing Service without the Matching Form, it will be necessary to return to the applicant any application received without it. A transcript from each college or university attended should then be sent directly to LSDAS, Educational Testing Service, Box 944, Princeton, New Jersey 08540. No transcript should be sent to the National Law Center. The LSDAS will analyze the transcript and send a copy to this law school and others designated on the registration form. If the transcript which has been forwarded to LSDAS does not show evidence of receipt of a Bachelor's degree, the applicant will be asked, upon acceptance, to submit a final transcript directly to the National Law Center.

To provide time for the evaluation of credentials of beginning students, all papers, including the Law School Admission Test score, should be received by the National Law Center before March 1. This means that the October or December Law School Admission Test should be taken (see "Entrance Requirements," pages 10–12).

All papers of transfer students should be received by the Admissions Office no later than June 2 for the fall semester, December 3 for the spring semester, May 1 for the first summer session, and June 2 for the second summer session.

For additional information, see the official *Pre-Law Handbook* prepared by the Law School Admission Council and the Association of American Law Schools. The Handbook includes material on the law and lawyers, pre-law preparation, applying to law schools, and the study of law, together with individualized information on most American law schools. It may be obtained at college bookstores or ordered from Educational Testing Service, Princeton, New Jersey 08540.

Master's and Doctoral Programs.—Students are admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions.

Application for admission, together with all required credentials, must be received by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

Unclassified Students.—Lawyers who wish to take graduate courses may be admitted at the beginning of the fall semester, the spring semester, or any of the summer sessions. Students who wish to earn credits for transfer toward a

Bachelor of Laws or Juris Doctor degree at another institution may be admitted to the summer sessions if they are students in good standing at an accredited law school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1. Application for admission, with required credentials, for a student who wishes to earn credits for transfer toward a Bachelor of Laws or Juris Doctor degree at another law school (see page 25), should be received at the Office of Admissions of the National Law Center at least one month prior to the first day of registration for the semester or summer session for which application is made.

2. Application for admission, with required credentials, for lawyers who wish to take graduate courses (see page 25), should be received at the Office of Admissions of the National Law Center by July 1 for the fall semester, November 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

READMISSION

A student who was previously registered but did not attend during the most recent semester (summer term excluded) should file an application for readmission. Closing dates for readmission are the same as those for admission (see "Application for Admission," page 28).

If the student has attended one or more higher institutions during his absence from the University or if he applies as a degree candidate and was previously a nondegree student, he must have complete, official transcripts sent to the Dean.

Registration

Before attending classes each student must register in person. No student will be registered until proper credentials have been filed and approved (see "Admission").

No registration is accepted for less than a semester or one summer session.

A student may not register concurrently in George Washington University and another institution. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration.*

ELIGIBILITY FOR REGISTRATION

A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student.—Upon receipt of a *final letter* of admission a new student is eligible for registration on the stated days of registration.

Readmitted Student.—A student previously registered who was not registered for courses during the preceding semester or summer session must apply for and receive a letter of readmission (see "Readmission," above) before becoming eligible for registration.

DATES AND PLACE OF REGISTRATION

Registration is held in Stockton Hall, 720 Twentieth Street, N.W., during the following periods: *fall semester,* August 20 and 21; *spring semester,* January 11 and 12.

A late-registration fee of $15 is charged each student who is permitted to register after the regular registration days.

Registration may be changed only with the permission of the Dean.

Fees and Financial Regulations

The following fees and financial regulations were adopted for the 1981 summer sessions and the 1981–82 academic year.

Tuition Fees

J.D. candidates:	
Full-time program (11 or more hours*), each semester	$2,600.00
Part-time program, each semester hour	200.00
Master's degree candidates (LL.M., M.Comp.L., and M.Comp.L. (Am. Prac.)) and Continuing Legal Education students, each semester hour	185.00
S.J.D. candidates,† full program, including the final examination	5,300.00

University Center Fee (charged all students registered on campus)

Students registered for 11 or more semester hours:	
Each semester	55.50
Students registered for less than 11 semester hours:	
Each semester hour for which the student registers	5.25

Future Tuition Increases—The University has had a policy of projecting tuition increases for three years in advance; however, the uncertainty of current economic conditions will not permit continuance of this policy. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound educational basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition may be required.

Graduation Fee	25.00

Special Fees

Application fee (degree candidate), nonrefundable	30.00
Application fee (unclassified student), nonrefundable	15.00
Application fee (unclassified post-J.D. summer student), nonrefundable	10.00
Application fee for room reservation, nonrefundable	100.00

* With the prior permission of the Dean, a J.D. degree candidate may take more than 14 semester hours after the first year of study.

† The tuition fee is to be paid at the rate of $1,325 per semester for four successive semesters, exclusive of the summer term or terms. If the Faculty should approve an extension of time, the student must maintain continuous enrollment.

Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—$100, nonrefundable, by a date specified in the letter of admission, $350 by June 1) 450.00
Fee for binding Master's theses and S.J.D. dissertations 15.00
Late-registration fee, for failure to register within the designated period 15.00
Late-payment fee, charged for failure to make payments when due (see "Payment of Fees," below) 15.00
Replacement of lost or stolen picture identification card 2.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," below) 35.00
Returned check fee, charged a student whose check is returned because of insufficient funds or for any other reason 15.00
Transcript fee, for each transcript of record..... 2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy ..... .50

Registration on campus in the University entitles each student to the following privileges: the services of the Student and Alumni Career Services Office; the use of the University Library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; subscription to the *University Hatchet,* the student newspaper; admission to University debates; medical attention as described under Student Health Service. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University with student identification number shown in upper left hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Students registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the ninth week of classes for the fall and spring semesters. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,200 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits his right to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold

grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Returned Checks—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student will forfeit all rights to check cashing at the University, and future payments for tuition, dormitory, food service, and other special fees will require payment by cash, certified check, or money order.

PREPAID AND DEFERRED PAYMENT PLANS

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the Dean. Withdrawal from courses is permitted after the midpoint of a semester only in extraordinary circumstances. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:
   Withdrawal on or before Saturday of the first week of classes 90%
   Withdrawal on or before Saturday of the third week of classes 75%
   Withdrawal on or before Saturday of the fifth week of classes 50%
   Withdrawal after the fifth week of classes ..... None
2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student,* the above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.
3. A student enrolled in a full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.

* No refund of the $100 deposit required of entering students is granted. Regulations covering withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes.*

4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid

The National Law Center has been able in recent years to assist many students in obtaining the financial aid they require, through full or partial scholarships, various loan programs, part-time employment, or a combination of these kinds of assistance.

GRADUATE AND PROFESSIONAL SCHOOL FINANCIAL AID SERVICE

The National Law Center participates in the Graduate and Professional School Financial Aid Service (GAPSFAS), which provides an analysis of an applicant's financial needs. Entering students wishing to receive financial aid should request the materials from GAPSFAS, Education Testing Service, Box 944, Princeton, New Jersey 08540. The information provided by the applicant and the applicant's parents will be analyzed, and a copy of the report will be sent to the Law Center. In addition, students entering the National Law Center who desire to be considered for a scholarship must submit a letter to the Law Center by March 1 outlining their academic qualifications, their extracurricular activities, and their reasons for believing a scholarship award to them is justified.

Students needing financial assistance should file with GAPSFAS in time for their reports to be received at the Law Center as early as possible since the Committee on Student Financial Aid of the Center will begin making awards in March, and available funds are limited.

No awards will be made to an entering student until the admission process has been completed.

JURIS DOCTOR PROGRAM

Scholarships and Research Assistantships

Application and correspondence concerning scholarships and research assistantships should be sent directly to the Dean. Unless otherwise specified, application and supporting credentials should be submitted no later than March 1 preceding the period for which the award is made.

Arent, Fox, Kintner, Plotkin & Kahn Scholarship (1973).—Scholarship aid for needy law students from the Washington, D.C., area.

Mildred Gott Bryan Scholarship Fund (1965).—Partial scholarship aid for students in the National Law Center.

Charles Worthington Dorsey Memorial Scholarship (1947).—Memorial to Charles Worthington Dorsey, LL.B. 1881, LL.M. 1882. A full-tuition scholarship for the course leading to the degree of Juris Doctor, awarded to a needy and promising graduate of this University with a Bachelor of Arts or equivalent degree. Ordinarily this scholarship is awarded once every three years.

Honor Scholarships.—Two scholarships available each year to students entering upon full-time study. Each scholarship provides a cash award, in addition to tuition aid, in an amount depending on need, for all three years. These scholarships are awarded on the basis of outstanding college records, both academic and extracurricular; Law School Admission Test scores; and need. To retain the scholarship for the second and third years, the candidates must maintain a *B* average, both for each year and cumulative.

Hunton and Williams Scholarship (1981).—An annual award of $1,000 given by the law firm of Hunton and Williams in recognition of the quality of the legal education offered at this law school.

Law Center Tuition Remission.—For Juris Doctor students, based on financial need.

Phi Delta Delta Scholarships (1959).—Zeta Chapter of Phi Delta Delta Legal Fraternity (International), provides tuition aid to a student in the second year of the Juris Doctor program who excelled in scholastic achievement and service to the Center in the first year.

Vernon Romney Scholarship Fund (1977).—To provide a scholarship to some worthy student in the Law School.

Trustee Scholarships.—Scholarships awarded each year to entering full-time students, for tuition aid, in amounts depending on need. Candidates must have demonstrated qualities of leadership, in addition to scholastic attainment. To retain the scholarship, the successful candidate must maintain a *B* average, both for each year and cumulative. Application must be made to the Dean before March 1.

Tuition-aid scholarships are also available to continuing second- and third-year full-time students with demonstrated scholastic ability, on the basis of financial need and capacity for leadership. Application should be made to the Dean prior to June 1.

Frank S. Whitcomb Scholarship Fund (1971).—Bequest of Frank S. Whitcomb for the purpose of aiding and assisting worthy young men and women in securing a legal education.

Graduate Fellowship Information Center.—Students may also wish to visit the Graduate Fellowship Information Center (2025 H St., N.W.) for additional information on fellowships and grants.

Loan Funds

Through the generosity of friends of the University a number of loan funds are available. Among them are the Lyle T. Alverson Loan Fund; the Robert Ash Loan Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafritz Foundation Minority Law Student Loan Fund; the Robert and Mary McConnel Cooper Loan Fund; the Robert McKinney Cooper Memorial Loan Fund; the J. Forrester Davison Loan Fund; the District of Columbia Bar Association Loan Fund; the J.W. Ehrlich Foundation Loan Fund

the Newell W. Ellison Loan Fund; the Harold L. and Violet George Foundation Loan Fund; the George Washington Law Association Loan Fund; the Morris Golub Loan Fund; the Jephson Educational Trust Loan Fund; the Law Association Loan Fund for the law classes of 1912, 1918, 1921, 1924, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 1942, 1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the Law School Loan Fund; the Oscar Lawler Memorial Loan Fund; the Horace L. Lohnes Memorial Assistance Fund; the Jessie B. Martin Loan Fund; the Robert N. Miller Loan Fund; the Joan Murphy Loan Fund; the Mike Pelekiri Loan Fund; the Phi Delta Delta Loan Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan Fund; the Samuel L. Samuel Loan Fund; the H. William Tanaka Law Students Assistance Loan Fund; the Orville Hassler Walburn Memorial Loan Fund; the W.H. Williams Memorial Student Loan Fund; the Ruth F. Wilson Loan Fund; and the Yadao and Kanemoto Loan Fund.

In addition, financial assistance is available through the Guaranteed Student Loan Program, National Direct Student Loans, and other sources.

Application for financial assistance should be made in the Office of the Dean.

MASTER'S AND DOCTORAL PROGRAMS

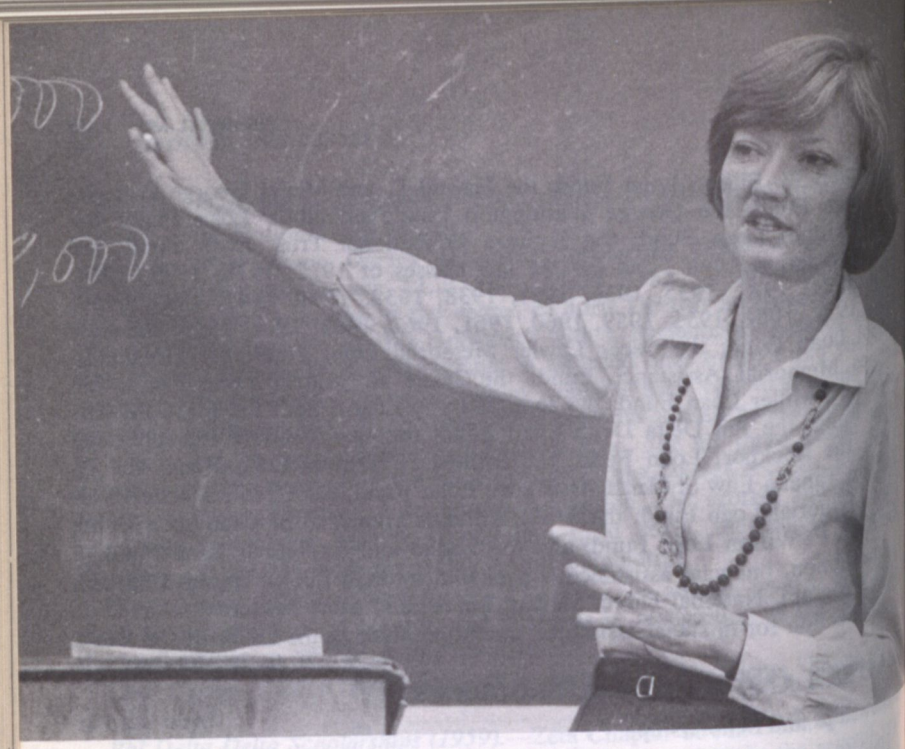
Fellowships and Scholarships

Application should be made before March 1 preceding the period for which the award is made. The applicant should submit an application for admission as a degree candidate and a personal letter applying for a fellowship to the Dean. The letter of application should contain complete biographical data, information as to experience in practice or teaching, and copies of or citations to published legal writings, and such other information the student believes will be of assistance in the consideration of the application. Applicants should arrange for letters of recommendation to be sent from two members of their law faculty directly to the Dean. The applicant's academic rank in class should be included either in the transcript of the law school or in the letters of recommendation.

Marcus B. Finnegan Memorial Fellowship.—Established in memory of Marcus B. Finnegan, LL.M. '57, who, as an alumnus, lawyer, and teacher, brought distinction to the field of patent law. The Fellowship was established in 1979 with generous gifts by Mr. Finnegan's law firm, Finnegan, Henderson, Farabow, Garrett & Dunner, his clients, and his many friends. The income from the Fellowship is used to finance a Graduate Fellowship in Intellectual Property with a requirement that the recipient of the Fellowship prepare a publishable paper in the field of international intellectual property.

Richard Paul Momsen Scholarships for Brazilian Graduate Law Students.—Bequest of Richard Paul Momsen, LL.B. 1912. Awarded 1980–81 and alternate years, for the study of U.S. constitutional law and the law of patents and trademarks.

Teaching Fellowships.—Three or four fellowships available each year with a stipend of $8,000 plus tuition for an approved course of study leading to an advanced degree. Teaching fellowships are awarded for a term of two academic years. Fellows conduct the first-year course in Legal Research and Writing and work with the students to improve their legal writing ability. By arrangement with the Dean, they may also be given the opportunity to teach additional courses.



Prizes

Jacob Burns Prize.—Established by Jacob Burns, a law alumnus and Trustee of the University. A medal and $100 awarded annually to each of the two members of the winning team in the upperclass Van Vleck Moot Court competition.

The Michael D. Cooley Memorial Prize.—A plaque and a cash award given to that individual in each graduating class who has been most successful in maintaining his or her compassion, vitality, and humanity during law school. The recipient of this award is selected by the graduating class during the spring of the third year at the National Law Center.

Ogden W. Fields Graduate Prize.—Fifty dollars awarded annually to the graduate student who has demonstrated the highest overall proficiency in a course in labor law.

Charles Glover Prize.—Established by Charles Carroll Glover, Jr., an Honorary Trustee of the University, in memory of his great-grandfather, an illustrious member of the bar of the District of Columbia. A cash award given annually to the student who has attained the highest average grade in the third-year, full-time course.

Kappa Beta Pi Prize.—Awarded by Eta Alumnae Chapter to the law student who attains the highest average for the first year.

John Bell Larner Prize.—By bequest, a medal awarded annually to the member of the graduating class who attains the highest average grade in the entire course for the degree of Juris Doctor.

John Ordronaux Prizes.—By bequest, $75 awarded annually to the student who has attained the highest average grade in the first-year, full-time course, and $75 to the student who has attained the highest cumulative average grade at the end of the second-year, full-time course.

United States Law Week Award.—Presented to an outstanding senior law student.

Jennie Hassler Walburn Prize.—A cash award to the outstanding student in the field of civil procedure, established by the will of the late Professor Orville Hassler Walburn in memory of his mother.

Regulations

ACADEMIC WORK LOAD

Juris Doctor Candidates.—Juris Doctor candidates without substantial outside employment may take a program of studies of 14 hours a week. Such students may take courses in the evening only if they are not scheduled in the daytime and if a majority of the hours taken are in day courses. The Dean is authorized to approve programs of study of more than 14 hours in exceptional cases; however, no program will be approved which would permit the student to complete requirements for the degree in less than 28 months after beginning the first year of law study. Students with more than 15 hours of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week. Students taking a majority of their classes in the evening may not take more than 10 hours a week; the minimum load is 8 hours, except in special cases where 6 may be approved by the Dean for a limited time. A minimum schedule of 11 hours in the day division is required except in exceptional circumstances when a reduced program is authorized by the Dean.

Students taking more than 8 hours in the day division or 4 hours in the evening division must have the permission of the Dean to take a Bar Review course.

Students may transfer from the day division to the evening division only with the permission of the Dean.

With the approval of the Dean, second- and third-year students may take a maximum of 6 semester hours of appropriate courses in other departments of the University; such a student must receive a grade of at least *B* to obtain credit for such courses, and in no event will the grade count in computing the cumulative average.

Master's Candidates.—Master's candidates without substantial outside employment may take a maximum of 12 hours a week. Students with more than 15 hours of outside employment must take a limited program of study not to exceed 8 hours a week. The minimum load is 4 hours unless approval for fewer hours is given by the Dean for a limited time.

ATTENDANCE

Regular attendance at classes is required and is necessary for successful work. A student who is deficient in class attendance in any course may be barred from taking the examination.

CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another of the same course without the approval of the Dean. Students may drop courses only with the written approval of the Dean. In addition, approval of the in-

structor is ordinarily required unless the request is made early in the semester. Under no circumstances may any student drop a course after the last day of classes in any semester or summer session.

RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examination in seminars and in other courses, as indicated in the course descriptions. To receive a numerical grade on a research paper, the paper must be submitted by the last day of classes in the semester or, with the permission of the instructor, by the last day of the examination period (the last day of any examination given in any course). For sufficient reason, the instructor may extend the deadline (but not later than the last day of the examination period of the following semester, or without express permission of the Dean, not later than the normal graduation date for the student), subject to the following conditions: (1) no student will receive any credit for the course for any purpose until a paper acceptable to the instructor has been submitted; (2) the only grade the student may receive for the course is *CR* (Credit) or *NC* (No Credit). Failure ultimately to submit any paper for the course will result in a grade of 45. Students who are candidates for the J.D. degree may register for one course requiring a research paper in each semester; with the approval of the Dean such students may register for more than one such course each semester.

EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the Dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a make-up examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit, or (2) having the grade *I* (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the Dean's permission to drop the course.

CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to courses regularly given on a Credit/No Credit basis, 12 semester hours of elective

course work on a Credit/No Credit basis, and will receive a grade of Credit if the course is satisfactorily completed with a grade of 65 or better. No student may change from a numerical grade to a Credit/No Credit basis in a course during the last four weeks of classes except with the permission of the instructor. An unexcused failure to take an examination in a course or failure to submit a required research paper will result in the recording of a grade of 45 for a course taken on a Credit/No Credit basis.

No student may take more than 17 semester hours of courses (including Law 220 and other courses regularly given on a Credit/No Credit basis) on a Credit/No Credit basis.

Students are advised to consider carefully the advisability of electing to take courses on a Credit/No Credit basis. In the opinion of the faculty, a student's election to take courses on a Credit/No Credit basis may, in view of the importance apparently attached to grades by educational institutions and employers, be detrimental to the student's career in the legal profession.

GRADES

Grades are given in numerical terms equivalent to letter grades as follows: 85–100, *A*, Excellent; 75–84, *B*, Good; 65–74, *C*, Satisfactory; 55–64, *D*, Poor —below standard for graduation: 45–54, *F*, Failure. In Law courses 220, 321–22, 323, 342, 343, 345, 346, 385, 399, 459, 479, 509, 579, and 593 grades are *CR*, Credit (minimum grade of 65 required for J.D. candidates, 75 required for LL.M. candidates); *NC*, No Credit. In Law 220, the grade of *H* (Honors) may be earned for work of excellent quality. A student who has been excused from taking a regularly scheduled examination is given the grade of *I*, Incomplete. See "Examinations" (above) for grade upon failure to take an examination. Grades between 55 and 100 indicate that the work has been completed and credit given. Grades between 55 and 64, however, do not represent satisfactory work and adversely affect a student's cumulative average. No credit is given to J.D. and M.Comp.L. candidates for grades below 55 or to LL.M. candidates for grades below 65. No grade may be changed by an instructor after it has been posted in the law school or disclosed to a student unless there has been an error in arithmetic certified in writing as such by the instructor.

Any student who receives a grade below 55 (*F*) has the right to retake the course once, from the same or a different instructor, but only within the next academic year. (This does not apply to post-J.D. students.) The grade received in the retaken course shall be entered into the student's record in addition to the original grade, and both grades shall be included in computing the student's average. A student may exercise the right to retake a course only with respect to two different courses during study at the Law Center.

The cumulative average of a student includes all grades in all courses taken while a candidate for a particular degree.

EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

Candidates for the Degree of Juris Doctor.—A student whose cumulative average at the end of any semester falls below 65.0 but is above 64.0 will be put on probation. If such a student fails to raise the cumulative average to 65.0 at the end of the next semester, the student will not be permitted to

register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester falls below 64.0 will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee to register.

A student who fails or receives a grade of No Credit in more than one course over the entire period of law study will not be permitted to register for any succeeding semester or to graduate unless the student petitions for and receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing provisions will be excluded as of the beginning of the semester for which the student was ineligible to register.

Students who are registered at the time they receive notice that they will not be permitted to register for the next semester are entitled to withdraw from school and to receive a full refund of the tuition paid for the semester, or to complete the work for which they are registered.

Any student excluded may petition for reinstatement; if the student can demonstrate that the low grades were due to circumstances beyond the student's control and that the student has the capacity to pursue the study of law with a definite likelihood of success, that student may be readmitted subject to such conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete the first two semesters of law study before being denied permission to register for a succeeding semester.

For this purpose the term "semester" includes a session of the summer term.

Candidates for Masters' and Doctoral Degrees.—A candidate for a master's or doctoral degree whose work is not satisfactory in the opinion of the faculty, taking into consideration the requirements and standards for the degree, may, by action of the faculty, be excluded at the end of the semester for which the candidate is currently registered.

A cumulative average of 78 (see page 19) is required for the Master of Laws degree and a cumulative average of 65 (see page 24) for the Master of Comparative Law degrees. A student whose cumulative average falls below the required minimum at any time will be ineligible for continuation in the program without the permission of the Dean. Such a student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Dean or the Board for Graduate Studies.

Unclassified Students.—An unclassified student whose work is not satisfactory may be excluded at the end of the semester for which the student is currently registered.

SUMMER SCHOOL CREDIT

Students planning to attend summer school sessions at other law schools and desiring to use credits obtained at such schools in their Juris Doctor program at this Center must first have the courses they wish to take approved by the Dean. Students may not take courses in summer sessions at other law schools in this vicinity if these same courses are being given during the Summer Sessions at the National Law Center. In no event will credit be given for unsatisfactory work or be recognized in excess of that which might be obtained in

similar period in this program. Students who register at another law school must provide the Dean with an official transcript of their work there promptly on its completion.

TRANSCRIPTS OF RECORD

Official transcripts of student records will be issued on request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript.

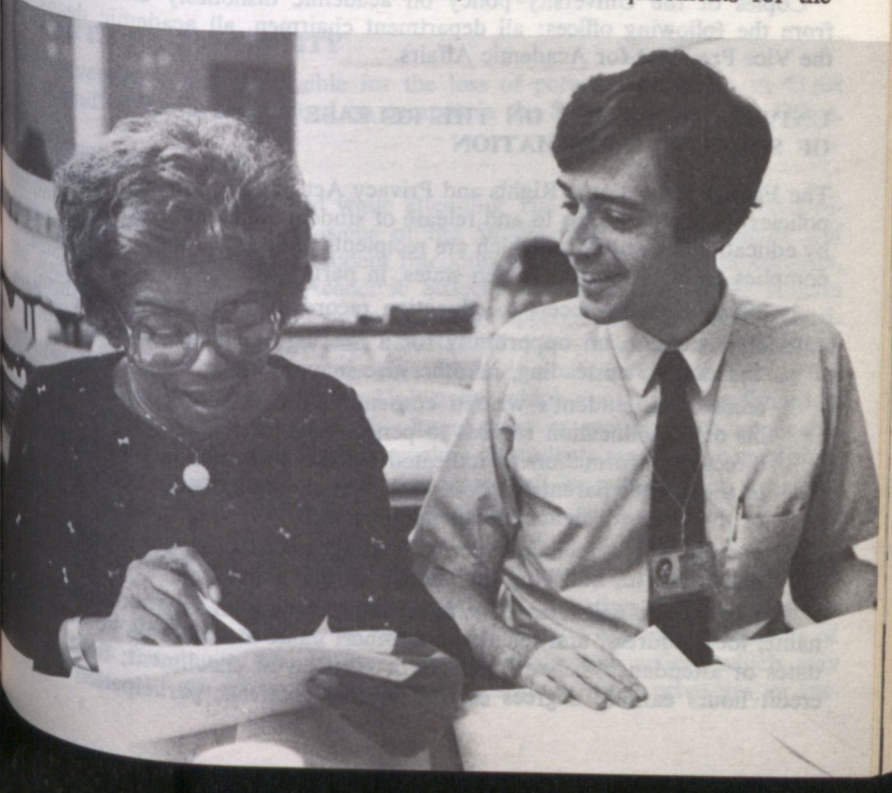
CONTINUOUS ENROLLMENT

Degree candidates are expected to maintain continuous enrollment until *all* degree requirements are satisfied. By failing to register for one semester or more, the student breaks registration and must be readmitted (see "Readmission," page 29). A readmitted student is required to satisfy the curriculum requirements existing at the time of readmission.

GRADUATION REQUIREMENTS

Diplomas are awarded in February, May, and September.

To be recommended by the Faculty for graduation, a student must have met the admission requirements of the National Law Center; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the



degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions. If they wish, such students may participate in the Winter Convocation.

ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper university channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organi-

izations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO DISMISS STUDENTS

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled and the student will be ineligible (except by special action of the Faculty) for subsequent registration.

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A "Lost and Found" Office is maintained on campus in the Safety and Security Office.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University, which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or sus-

pension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

Center for Academic and Administrative Computing

Director F. William Rambo

The Center for Academic and Administrative Computing is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week to all faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The Center operates an IBM 3031 (OS/VSI) central processing unit and a PDP 11 minicomputer which provides terminal and card remote-job-entry (RJE) to the 3031 for students. There is a full range of compilers and application software packages.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

Student Services

RESIDENCE HALLS

The University does not provide regular residence hall space for graduate students. However, the Housing Office refers graduate students to apartments as they become available in a University-owned building which is in the campus area. Additionally, the Housing Office operates an Off-Campus Housing Resource Center, and attempts to provide information and assistance for those seeking accommodations. For complete information on this service, as well as apartment guides and referrals, interested applicants should contact Director of Housing, George Washington University, Washington, D.C. 20052.

FOOD SERVICE

Contract food service is available from August to May, and is based on the undergraduate academic calendar of registration, exams, and vacation periods. Accommodations for the law school calendar are made. The rate for the seven-day, 19 meals per week plan has been set at $1,414. The any 14 meals per week plan costs $1,348, the any 10 meals per week plan, $1,294. Contract service is cafeteria style and provided in two residence halls and the Cloyd Heck Marvin Center. Meal coupons may also be used on a cash equivalency basis in the Marvin Center first floor a la carte cafeteria and in the Rathskeller.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for

students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the departments offering course work in the performing arts, and other student and faculty organizations.

The Center Governing Board, representing varied segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 935 22nd St., N.W.

Physicians, physician assistants, and nurse practitioners are available by appointment from 8:30 a.m. to 4:30 p.m., Monday through Friday. In addition, the clinic is open for primary care to walk-in patients Monday through Friday from 5 to 6:45 p.m., on Saturday from 9 a.m. to noon, and on Sunday from 10 a.m. to noon.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for students registered in degree programs or for those registered as University or summer students in the Division of Continuing Education and Summer Sessions. Interested students should contact the Student Health Service Office.

STUDENT EMPLOYMENT

A student taking more than 10 semester hours must limit outside employment to less than 16 hours (see "Academic Work Load," page 37). It is urged that full-time students refrain from engaging in outside employment during their first year. Although work in some special areas may contribute to the learning and experience of the student, as a general rule it will compete with time needed for adequate study and preparation, which are at the heart of a good legal education.

PLACEMENT SERVICE

The Law Center takes a continuing interest in the placement of its students and alumni. The Dean, the Faculty, and the Placement Office cooperate in providing information from alumni, law firms, government agencies, and other

sources concerning job openings for our seniors and alumni throughout the country. Other services include part-time and full-time law clerk listings, summer positions, programs on job-seeking skills, a library of available literature on law placement, counseling on various opportunities, resume preparation guidance, arrangement of on-campus interviewing programs, and the administration of the judicial clerkship evaluation program.

Of the 1980 graduates, 284 graduates informed the Placement Office of their positions. There was considerable variety in the types of positions obtained, with 127 in private law firms, 64 with government agencies, 22 with business concerns, 27 as judicial law clerks, 22 with public service/public interest organizations, 10 in military positions, and seven with academic institutions. These positions were located in 23 states, the District of Columbia, and two foreign countries.

VETERANS BENEFITS

The veterans counselor, located on the fifth floor of Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

OFFICE OF SERVICES FOR STUDENTS WITH DISABILITIES

The Director of the Office of Services for Students with Disabilities coordinates advising, orientation, and special services which address the needs of disabled students. The Director also serves as a central point of contact from which the University community may obtain information and assistance in serving disabled students. A resource library maintained in the Services Office is available for general use.

In addition to coordinating a program of general assistance to promote integration of disabled students as fully as possible into the life of the University community, the Director administers reading and sign language services for those with visual and auditory handicaps.

The Office of Services for Students with Disabilities is located on the fourth floor of Rice Hall, 2121 Eye Street, N.W.

COURSES OF INSTRUCTION

Courses for Juris Doctor Candidates

Career Planning and Course Selection

One of the great strengths of the National Law Center is the diversity of its course offerings and the flexibility it offers students to design their programs to fit their interests and career plans. Every spring a series of counseling sessions is held to provide students with an overview of course offerings in various areas of the law and to assist them in selecting courses and defining their career objectives. Students also may consult members of the faculty and the Associate Dean for Student Relations for course and career planning. In addition, the Placement Office provides a central storehouse of information regarding many types of legal careers.

The Law Center's broad offering of elective courses is listed below. Courses numbered 400 and above are generally more advanced, but are open to second- and third-year students who have taken the prerequisite courses. Both second- and third-year students may take more than one such course with the permission of the Dean.

Among the courses offering clinical work are: Law 343, 345, 346, 396, 398, 399, 459, 516, 579, and 596.

The courses of instruction listed below are subject to change. The University reserves the right to withdraw any course announced.

Elective Courses (Numbered 301–400)

Administrative Law (372)
Admiralty (302)
Advanced Criminal Procedure (334)
Agency and Partnerships (311)
Collective Bargaining and Labor Arbitration (339)
Commercial Paper (314)
Community Legal Clinic (346)
(1) Civil Administrative Law Clinic
(2) Immigration Clinic
(3) Outside Clinical Placement
(4) Small Business Clinic
(5) Institute of Law and Aging
Comparative Law (307)
Conflicts (309)
Corporations (312)
Creditors' Rights (318)
Current Decisions (321)
Disabled People and the Law (397)
Domestic Relations (348)
Federal Antitrust Law (330)
Federal Indian Law (391)
Federal Jurisdiction (332)
Fraud in Patent Practice (363)
Government Contracts (355)
Insurance (347)
International Law and World Order (303)
Journal of International Law (323)
Jurisprudence (335)
Labor Law (341)
Law and Accounting (351)
Law and Medicine (390)
Law and the Deaf (398)
Law Students in Court (345)
Law Students Civil Rights Research Council (343)
Legal Activism (396)
Legal Process (315)
Legal Writing (344)
Medicine for Lawyers (389)
Modern Real Estate Transactions (327)
Moot Court (342)
Patent Law (359)
Patent Office Practice (362)
Remedies (375)
Sales and Sales Finance (313)
Tax—Corporations and Shareholders (340)
Tax—Federal Estate and Gift (338)

Tax—Federal Income (336)
Trial Practice Court (385)
Trusts and Estates (I) (II) (325) (326)
Unfair Trade (329)
United Nations Law and World Order (304)
Women and the Law (394)

Advanced Courses and Seminars (Numbered 401–600)

Administrative Practices and Procedures (FDA) (411)
American Legislative History (593)
Business Planning (424)
Clinical Studies in Environmental Law (516)
Clinical Studies in Urban Law (579)
Community Property Law (569)
Computers and the Law (585)
Constitutional Law (592)
Copyright Law (525)
Court Review of Patent Office Decisions (523)
Crime Lab (473)
Criminal Practice (479)
Criminal Tax Prosecution (552)
Current Problems in Land Use Controls (504)
Drugs and the Law (481)
Energy (512)
Environmental Law (I) (508)
Environmental Litigation (513)
Environmental Planning (511)
Equal Employment (446)
Equal Employment Claims and Litigation (450)
Estate Planning (553)
Food and Drug Law (412)
Government Contracts (435)
Government Procurement Law (431)
Graduate Clinical Studies (596)
Health Care (485)
Immigration Law (586)
Income Taxation of Foreign Business and Investment (562)
Independent Studies (597)
Intergovernmental Relations I (505)
International Economic Law (426)
International Humanitarian Law of Coercion Control (533)
International Law of Air and Space (531)
International Law of Human Rights (537)
International Law of the Sea (532)
Labor Law (447)
Labor Litigation (448)
Labor Relations (443)
Labor Standards (442)
Land Development Law (501)
Land Development Planning (572)
Law and Criminology (I) (II) (475) (476)
Law and Psychiatry (486)
Law of Criminal Corrections (480)
Law of the Near East (548)
Legal Aspects of International Business Transactions (427)
Legal Research, Writing—Foreign Students (620)
Legislative Drafting (591)
Natural Resources Law (514)
Negotiations (535)
NLRB Procedures (445)
Occupational Safety and Health (OSHA) (451)
Patent Interference Practice (528)
Performance of Government Contracts (432)
Practical Economics for Lawyers (415)
Problems of the Consumer Clinic (459)
(1) Consumer H-E-L-P
(2) Bankruptcy Clinic
(3) "Contact 4" (Television Consumer Service)
(4) Consumer Protection Reporting Service
(5) Institute of Law and Aging
Professional Responsibility (594)
Public Economic Policy and the Law (403)
Public Policy and Mass Media (413)
Public Sector Labor Law (452)
Regulated Industries (414)
Regulation of Securities Markets (405)
Regulated Securities Trading (406)
Research in Public Law (598)
Securities Regulation (404)
Soviet Law (546)
Special Problems of Tax Policy (564)
Tax—Deferred Compensation (I) (II) (565) (566)
Tax—Partnerships and Subcharter S (551)
Tax Practice (567)
Tax—Real Estate and Income (558)
Tax—Special Corporation Problems (555)
Tax—State and Local (560)
Thesis (599) (600)

Trade Regulation (417)
U.S. Regulation of International Trade (542)
U.S. Trademark Law (526)
Use and Control of Nuclear Energy (518)
Water Pollution Control Law (515)
Water Resources (510)

Courses Not Offered 1981–82

Chemical Patent Practice (524)
Chinese Law (547)
Choice of Law and Forum in Transnational Contracts (540)
Community Economic Development (575)
Comparative Labor Law (440)
Control of Toxic and Hazardous Substances (517)
Current Problems in Civil Rights (460)
Diplomatic and Consular Law and Practice (536)
Environmental Law (II) (509)
Individual Rights (587)
Intergovernmental Relations (II) (506)
Juvenile Justice (487)
Law of Privacy (589)
Legal Problems in Education (588)
Legislation (366)
Patent and Know-How Licensing (522)
Police and the Community (477)
Product Liability (331)
Research in Patent, Trademark, and Copyright Law (529)
Tax-Exempt Organizations (557)
Tax—Oil and Gas (559)
United States Foreign Relations Law (534)

COURSE DESCRIPTIONS

The courses of instruction are described below. The number of hours of credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, a year course giving two hours of credit each semester is marked (2–2), and a semester course giving two hours of credit is marked (2).

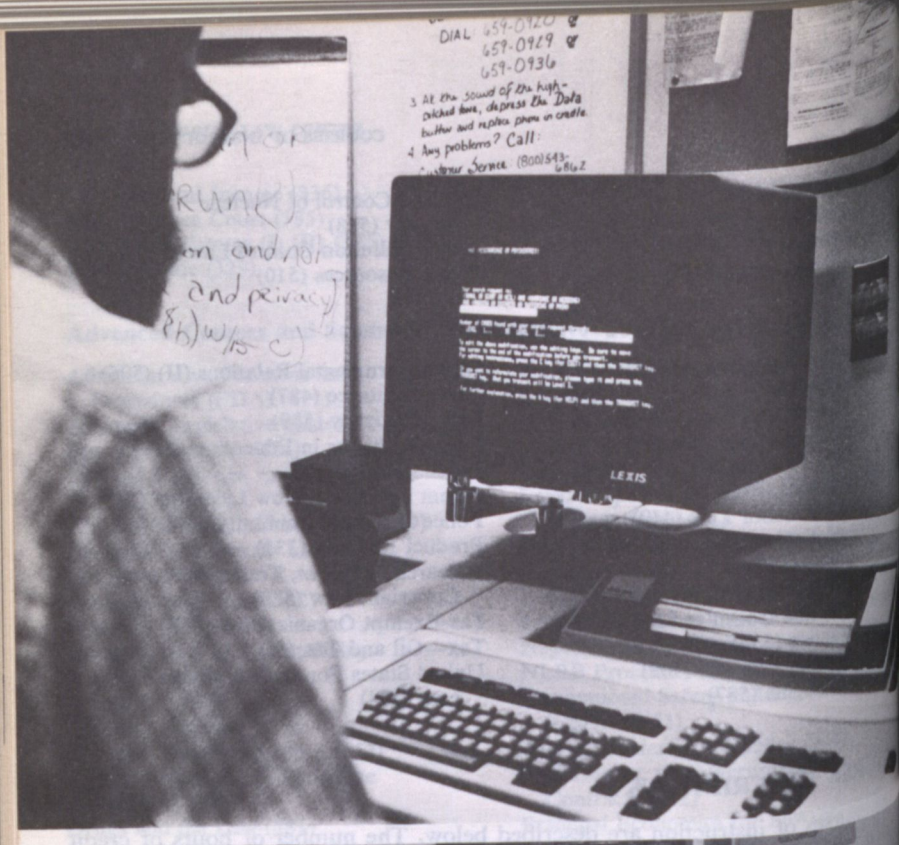
In most courses, a final examination is held during the examination period, and the grade in the course is determined in large part by that examination. These courses are parenthetically marked "Examination."

Courses that require the preparation of a major research paper in lieu of an examination are parenthetically marked "Research Paper." The satisfactory completion of such a paper by a student individually will satisfy the Legal Writing curriculum requirement for the J.D. degree.

Courses parenthetically marked "Problem Assignments," "Writing Assignments," "Take-home Examination," "Choice of Paper or Examination," or "Clinical Work" indicate the nature of the method planned by the instructor for determining in major part the grade to be given for the course. Only Research Papers qualify for the Legal Writing curriculum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morning and afternoon. Evening classes begin at 5:50 p.m. Many examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be held in the evening.

A parenthetical designation at the end of a course description indicates whether the course is scheduled to be offered in the spring or fall semester or in the summer sessions, and also usually whether it will meet in the day or evening. When a double-numbered course is designated "Academic year," the first half of the course is scheduled to be offered in the fall, the second half in the spring.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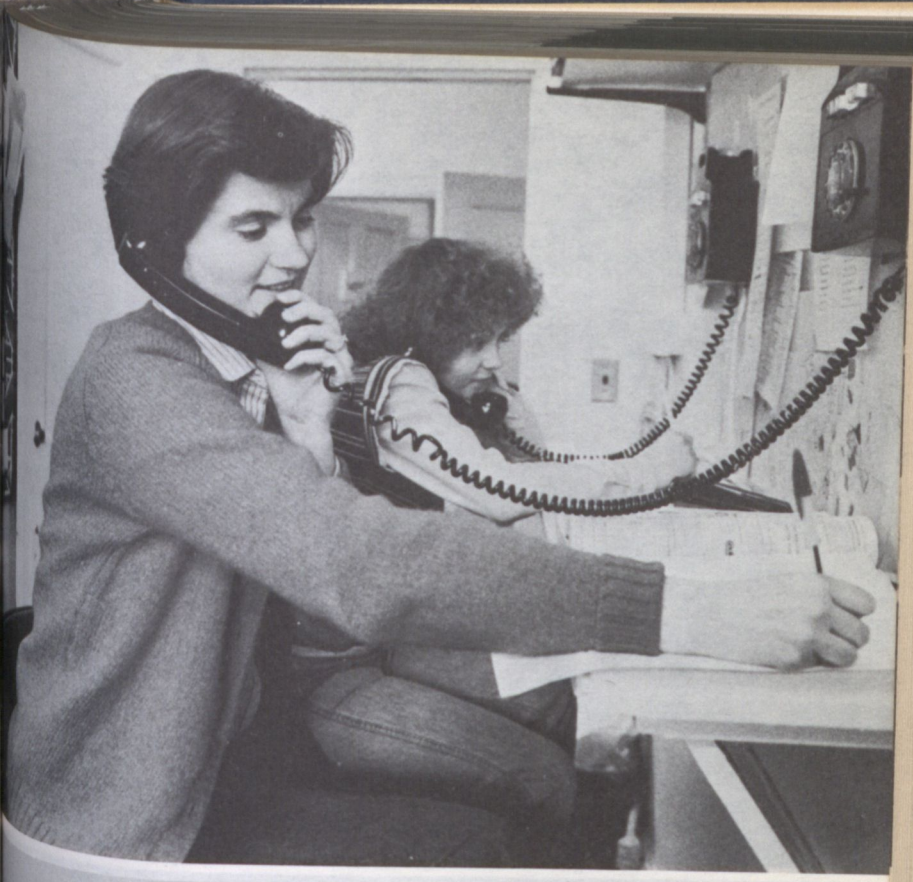

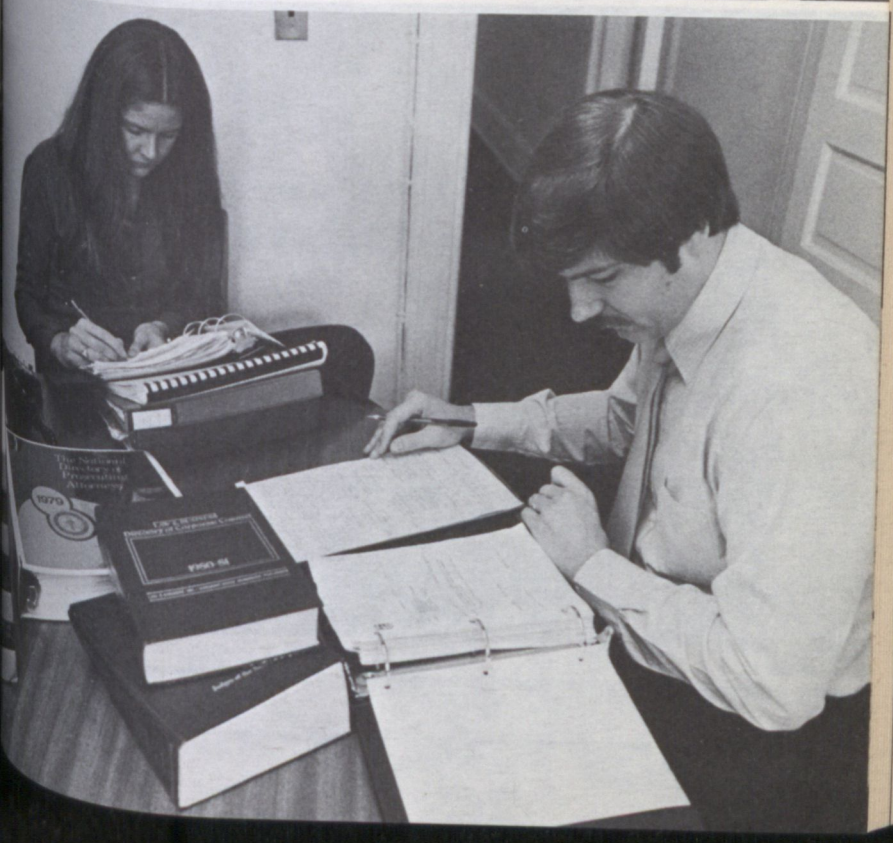

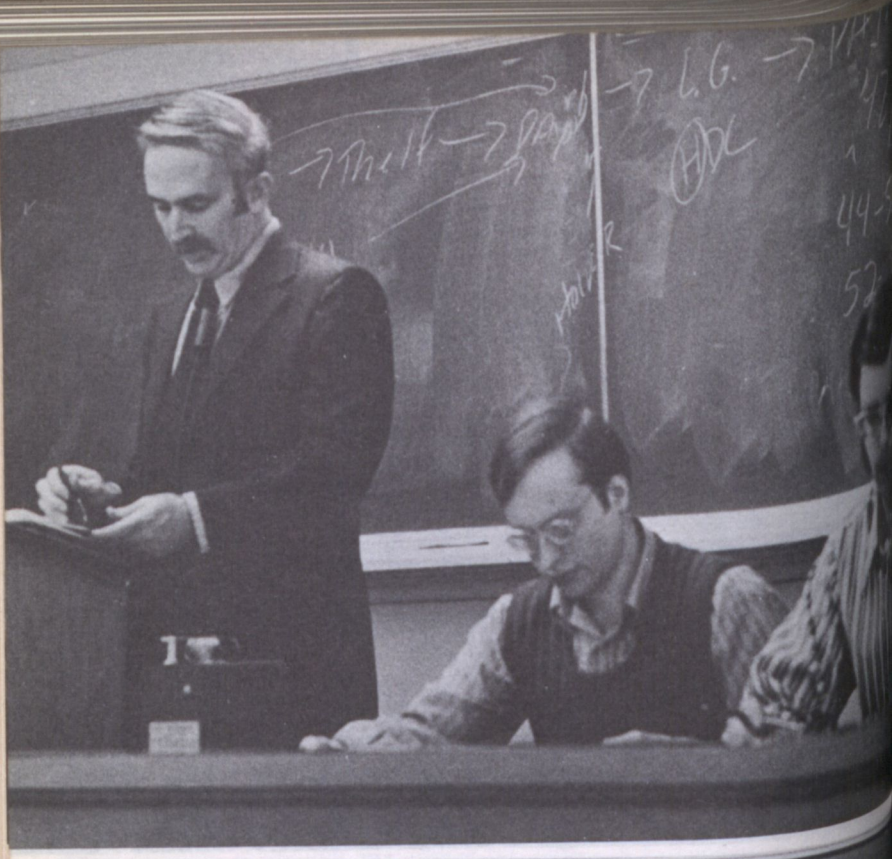
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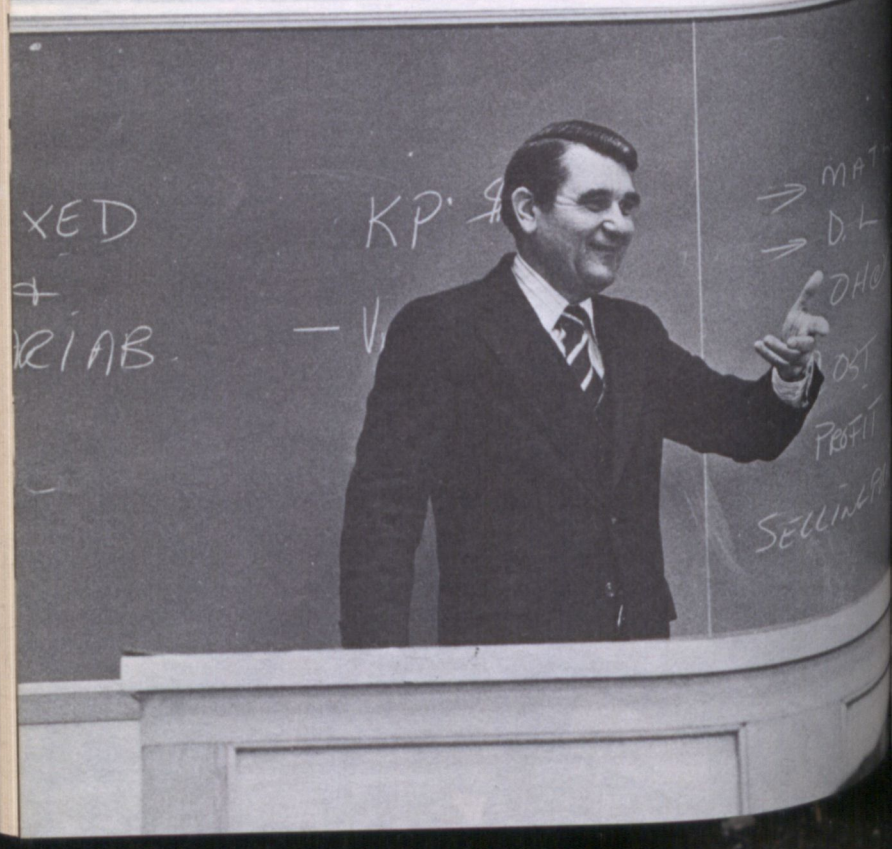
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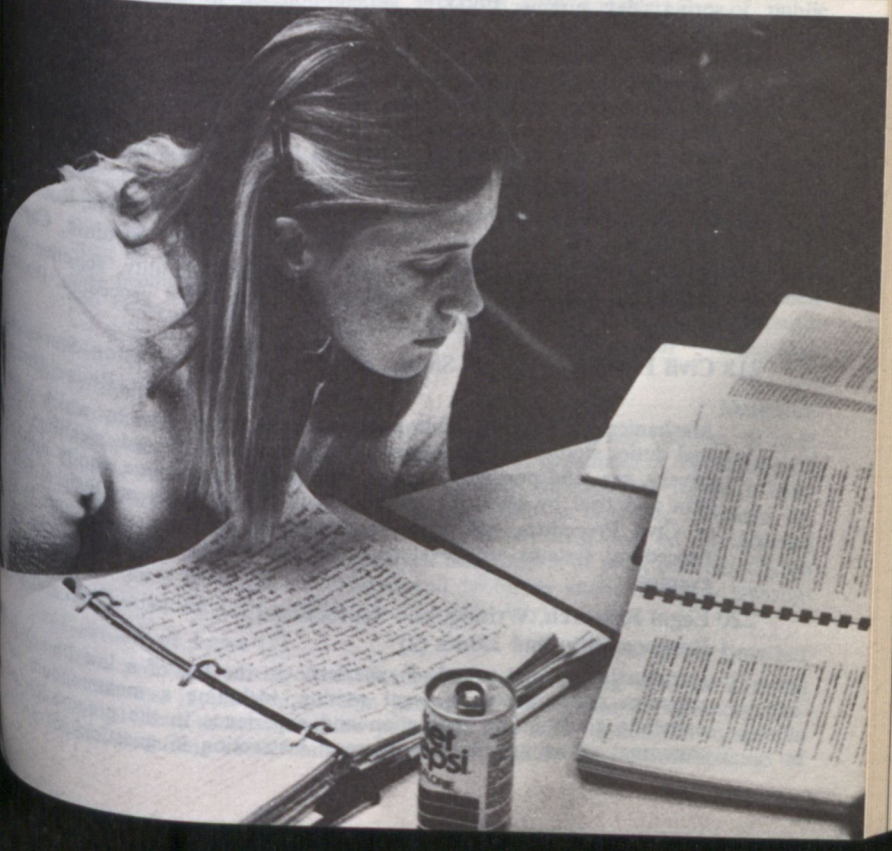
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REQUIRED COURSES

203–4 **Contracts I–II** (4–2) Nash, Cibinic, Pock, Caplan

Legal remedies of contracting parties, including damages in contract and quasi-contract, specific performance, reformation, rescission, remedies in tort; acts creating and terminating contractual rights, including offer and acceptance, mistake, problems of proof; function of consideration; conditions; assignments; third-party beneficiaries; effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)

207 **Torts** (4) Seidelson, Banzhaf, Schwartz, Sirulnik, Reitze, Dienes

Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses; causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. (Examination) (Fall—day and evening)

211 **Property** (4) Starrs, Schiller, Brown, Chandler

Basic concepts of personal property. Real property: historical background of the law of estates and conveyancing, types of estates, dower and curtesy, landlord and tenant relationship, concurrent estates, future interests at common law and after the Statute of Uses; introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Fall—evening; spring—day; summer 1981)

212 **Constitutional Law** (4) Mayo, Barron, Park, Cheh, Dienes

Basic principles of American constitutionalism; judicial function in constitutional cases; implementation of doctrines of separation of powers, federalism, limited government; development and exercise of national powers; introduction to civil rights and liberties. (Examination) (Spring—day and evening; summer 1981)

215 **Criminal Law and Procedure** (4) Starrs, Robinson, Zenoff, Sirulnik, Caplan

Purposes of criminal law, elements of criminal liability, selective consideration of specific crimes, introduction to criminal procedure. (Examination) (Fall—day; spring—evening)

218 **Civil Procedure** (4) Sharpe, Barron, Schwartz, Kayton, Stevenson, Cheh, Raven-Hansen, Reitze, Shreve

Mechanics of litigation—rules which govern the process by which rights and duties studied in substantive law courses are enforced; pleadings, discovery, pre- and post-trial motions, jurisdiction and venue, equity jurisdiction and trial by jury, former adjudication. Emphasis on Federal Rules of Civil Procedure, but principles and main problems indigenous to all procedural systems are developed. (Examination) (Spring—day and evening)

220 **Legal Research, Writing, and Professional Responsibility and Ethics** (2) Cheh and Staff

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of profes-

sional responsibility and ethics. The grade *H* (Honors), *CR* (Credit), or *NC* (No Credit) is given for this course. For Honors, a student must do work of excellent quality. For credit, a student must attain a minimum grade of 65. Failure to complete the work in this course will result in a grade of 45. (Fall—day and evening)

232 **Evidence** (4) Seidelson, Robinson, Albert, Park, Schechter

Preparation and presentation of evidence, including proof of writings; qualification and examination of witnesses with emphasis on impeachment; privilege; opinion testimony; determination of relevancy; demonstrative, experimental, scientific evidence; application of the hearsay rule. (Examination) (Spring—day and evening)

ELECTIVE COURSES

302 **Admiralty** (3) Sharpe

American practice and jurisdiction in admiralty; saving clause actions at law. Substantive maritime law of title and possession, maritime liens, personal injury and wrongful death, charter parties and bills of lading, general average and salvage and marine insurance, collisions. Lawmaking methods: judge-made law, statutes, international commercial custom, and treaties. (Examination) (Fall—evening; spring—day)

303 **International Law and World Order** (3) Mallison

An introduction to international law which provides the background for the study of specialized seminars; emphasis on national states as participants in decision-making processes with consideration of public bodies and other participants; analysis of range of available sanctions; roles and effects of international agreements under United States Constitution; introductory study of the World Bank. Complements but does not repeat material in Law 304. (Examination) (Fall—day and evening; summer 1981)

304 **United Nations Law and World Order** (2) Mallison

Introduction to international law through study of law and practice of United Nations Charter; structure and process of decision of United Nations; maintenance of international peace and security—peaceful settlement of disputes and national and collective self-defense; including current problems considered by the General Assembly and Security Council and recent decisions of the International Court of Justice. Complements but does not repeat the material in Law 303. (Examination) (Spring—day and evening)

307 **Comparative Law** (3) Delaume

Introduction to comparative method and analysis, basic features of civil law systems, sources, legal profession, judicial organization, constitutional issues. The course includes material dealing with selected issues of contemporary and practical interest in such fields as domestic relations, inheritance, contracts, torts, consumer protection. Emphasis on the intimate relationship between comparative law and conflict of laws, and description of methods of conflict avoidance and problems attendant upon transnational litigation. (Examination) (Spring—day)

309 **Conflicts of Laws** (3) Seidelson, Pock, Lowther

Legal problems arising from occurrences transcending state or national boundaries; jurisdiction; foreign judgments; constitutional influences; theoretical bases of choice of law principles and their application to specific fields, including torts, contracts, property, family law, administration of

estates, business associations. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Lowther—(Problem Assignments); Seidelson, Pock—(Examination) (Fall—evening; spring—day and evening; summer 1981)

311 Agency and Partnerships (2) Sharpe, Schiller

Employment relations, vicarious liability of employers for employees' torts, scope of employment, and independent contractors; agents' authority and apparent authority to contract for their principals, ratification; non-profit associations; the formation, operation, and termination of partnerships; limited partnerships. (Examination) (Fall—day and evening)

312 Corporations (4) Stevenson, Solomon, Park, Cheh, Pinto, Moody

Corporate law, with emphasis on operations and financing of corporations. Control of corporations, action by corporate directors, officers, shareholders. Control devices. Directors' and shareholders' duties of care and loyalty, insiders' transactions in shares of the corporation. Derivative suits, kinds of shares, dividends, corporate distributions. (Examination) (Fall—day and evening; spring—day)

313 Sales and Sales Financing (2) Albert, Rothschild, Adams, Pinto

Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day and evening; spring—day; summer 1981)

314 Commercial Paper, Check Collection, and Banking (2) Albert, Rothschild, Zubrow

Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection: the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice; Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Fall—day; spring—day and evening)

315 The Legal Process (3) Robinson, Levine

American legal institutions and their interrelationships and processes. Jurisprudential concepts in the context of specific problems commonly faced by private and governmental lawyers, legislators, courts, and administrative agencies. Issues of statutory interpretation, the roles of courts in making new law, and the allocation of functions between courts, administrative agencies, legislatures, and private decision-makers. (Examination) (Fall—day)

318 Creditors' Rights (3) Cheh, Zubrow

Creditors' remedies and debtors' protections under state law: writs of attachment, garnishment and execution, acquisition of liens and forced sales of property, self-help arrangements, and security agreements. Bankruptcy under federal law: who may file, the creation and administration of the bankruptcy estate, powers of the trustee, discharge of debt, rehabilitation plans for individuals under Chapter 13. (Examination) (Fall—day; spring—evening)

321–22 Current Decisions (1 or 2 per semester)

Limited to members of the student staff of the *Law Review*. A max-

mum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Academic year—day and evening)

323 **Journal of International Law** (1 to 4)

Limited to editors of the student staff of the *Journal of International Law and Economics*. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)

325–26 **Trusts and Estates I–II** (3–3) Weaver, Chandler, Solomon, Sims

Noncommercial transfers of wealth at death or during life. Law 325: essential elements and formalities for creation of trusts and execution of wills, revocation and alteration, grounds for contest, limits on property owner's power to control, intestate succession. Law 326: dispositive provisions, common questions of construction, future interests problems, administration of estates and trusts, charitable trusts. Prerequisite to Law 325: Law 211; to Law 326: Law 325. (Examination and Problem Assignments) **(Law 325: fall—day and evening; spring—day; Law 326: spring—day and evening)**

327 **Modern Real Estate Transactions** (2) Brown, Schiller

Advanced problems in purchase and sale of real estate: legal responsibility and functions of buyer, seller, broker, escrow agent, conveyancing attorney, title examiner, abstractor, insuror of title; process of examination and assurance of title and other interests in realty, including recording, registration and title insurance systems, settlements and closings, warranties, hazard insurance; emerging problems related to cooperatives, condominiums and property-owners' associations; problems related to compliance with subdivision, zoning, building and housing code regulations. (Examination) **(Spring—day)**

329 **Unfair Trade Practices** (3) Weston, Banzhaf, Schwartz, Schechter

Unfair trade practices at common law and under statutes; trademarks, trade names; copyright law; misappropriation of ideas; protection of competitors and consumers against false advertising under Federal Trade Commission Act; resale price maintenance under state Fair Trade Acts; state sales-below-cost statutes; Robinson-Patman Price Discrimination Act; miscellaneous business practices. (Examination) (Fall—day and evening)

330 **Federal Antitrust Laws** (3) Weston, Schechter

Sherman and Clayton Acts, related statutes. Price-fixing agreements and other types of trade restraints considered under Section 1; monopolizing considered under Section 2 of the Sherman Act. Mergers and tie-in sales; other activities under the Clayton Act. All types of business conduct raising questions under the antitrust laws, including trade association activities, exclusive-dealing arrangements, boycotts, patents and copyrights. (Examination) (Fall—day; spring—evening)

331 **Product Liability** (2) Schwartz

Development of the concept of product liability and consumer's remedies. Specific problems and processes in evaluation of risk and benefit encountered in government regulation of dangerous and defective products. Survey of civil actions for harm resulting from defective and dangerous products with reference to parties and proof in negligence, warranty, nuisance, fraud, misrepresentation, and other cases. Problems associated with hazard identification, insurance, and industry self-regulation. Review of Consumer Product Safety Act and current legislation dealing with in-

juries and remedies in specific areas. (Choice of Research Paper or Examination)

332 **Federal Jurisdiction** (2) Albert, Lowther, Barron, Kayton, Raven-Hansen, Schechter, Moody, Shreve

Relationship of federal courts to Congress and to the states, through analysis of cases dealing with federal judicial functions (including problems of advisory opinions, standing to litigate, justiciability), federal questions in federal courts, federal review of state court decisions (including relation between state and federal substantive law, procedural problems in exercising review, application of law to fact). The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Albert—(Examination); Lowther—(Problem Assignments) (Fall—day and evening; spring—day)

334 **Advanced Criminal Procedure** (2) Starrs, Robinson, Zenoff

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Starrs—(Examination and Problem Assignments); Robinson, Zenoff—(Examination) (Fall—day and evening)

335 **Jurisprudence** (2) Mayo, Park, Albert, Chandler

Basic jurisprudential concepts; nature of law; development of legal institutions; jurisprudential schools—natural law, analytical, historical, sociological, functional; law and logic; law and justice; the judicial process; legislative, executive, administrative decision-making; impact of politics, economics, and scientific advance on legal systems; contemporary trends in jurisprudential thought. Mayo, Park, Albert—(Examination); Chandler—(Research Paper) (Fall—day and evening; spring—day)

336 **Taxation—Federal Income** (3) Weaver, Hambrick, Solomon, Kempler, Sim

Survey of substantive provisions of federal income tax law, including concept of gross income, provisions affecting taxation of family and individual transactions, limitations on allowable deductions, sales and dispositions of property, problems of capital gains taxation, nontaxable exchanges. Weaver—(Examination and Problem Assignments); Hambrick—(Examination) (Fall—day; spring—day and evening; summer 1981)

338 **Taxation—Federal Estate and Gift** (3) Hambrick, Weaver

Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction and split gifts; tax procedure. (Examination) (Fall—day; spring—evening)

339 **Collective Bargaining and Labor Arbitration** (3) Merrifield, Rothschild, Scho

Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 341. Merrifield—(Examination and Problem Assignments); Rothschild—(Problem Assignments) (Spring—day and evening)

340 **Taxation—Federal Income, Corporations and Shareholders** (3) Hambrick, Solomon, Kempler

Continuation of Law 336. Primary emphasis on corporate-shareholder relationships. Problems of corporate dividends, redemptions of stock

distributions in partial and complete liquidation, stock dividends, bail-outs, and dividends in kind closely analyzed. Federal income tax problems involved in the formation of corporations, the sale of corporate businesses (including collapsible corporations), mergers and acquisitions, and corporate divisions. Students who have received credit for former Law 337 cannot receive credit for Law 340. Prerequisite: Law 336. (Examination) (Fall—evening; spring—day; summer 1981)

341 **Labor Law** (3) Merrifield, Albert, Rothschild, Jaffe

Law governing labor-management relations, organizations and representation of employees, regulation of economic weapons, enforcement of collective bargaining agreements, interunion and intra-union relations. (Examination) (Fall—day and evening; summer 1981)

342 **Moot Court** (1 or 2)

Satisfactory participation in the upperclass competition results in one hour of academic credit. Finalists in the upperclass competition receive two hours of academic credit. Finalists in the first-year competition receive one hour of academic credit. No academic credit is awarded to nonfinalists in the first-year competition. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

343 **Law Students Civil Rights Research Council (LSCRRC)** (2, 3, or 4) Sirulnik and Staff

Clinical problems concerned with the legal problems of minorities, women, and the poor. Students work with organizations such as the Lawyers Committee for Civil Rights Under Law, Women's Legal Defense Fund, Civil Rights Division of the Justice Department, Institute for the Development of Indian Law, National Committee Against Discrimination in Housing, and National Senior Citizens Law Center. Approximately 60 hours of work per semester is required for each credit hour. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Permission of the instructor is required prior to registration. (Fall, spring, summer)

344 **Legal Writing** (1 or 2) Staff

Preparation of a research paper under the supervision of a full-time member of the Faculty who will determine, prior to registration, whether the work required for the topic selected justifies one or two semester hours of credit. If elected for one hour of credit, this course may be repeated to meet the legal writing requirement for the degree. Approval of the faculty member is required prior to registration. (Research Paper) (Fall and spring—as arranged; summer)

345 **Law Students in Court** (4) Bright

Open to third-year law students who have completed 51 credit hours at the time the course commences, including Law 215, 218, and 232. Students represent indigent litigants in the Small Claims, Landlord-Tenant, and Criminal (misdemeanors) division of the D.C. Superior Court. Duties include client interviews, investigation, settlement negotiations, preparation and argument of motions, and conduct of trials. Students are required to spend one day in court and attend seminars each week. Some seminars are held off campus. Application must be made during the spring semester of the preceding academic year. Students are selected on the basis of their academic record and interest in litigation and working with indigent clients as demonstrated by elective courses, other clinical work, extracurricular activities, and employment experience. A commitment of two semesters

(one of which may be summer) is required. This course may not be taken at the same time as Law 579, or any litigating activities in Law 346. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged; summer)

346 Legal Aid (arr.) Sirulnik and Staff

(1) *Civil Administrative Law Clinic*—Working under the supervision of staff attorneys, students represent indigent litigants before state and federal administrative agencies. Activities include Social Security Disability hearings, Rental Accommodations Office hearings, Unemployment and Workman's Compensation hearings, Food Stamp reviews, will writing and other public benefits program work. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration.

(2) *Immigration Clinic*—Clinical work includes representation of clients at deportation hearings, and oral argument before the Immigration and Naturalization Service, Board of Immigration Appeals, and the U.S. Court of Appeals. Students will assist aliens residing in the Washington area with a wide variety of problems, including adjustment from nonimmigrant to immigrant status, obtaining labor certifications and work visas, obtaining visas for their relatives in other countries to enter the United States, and obtaining voluntary departure orders for those whose visas have expired and who are threatened with deportation. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration. Successful completion of Law 586 suggested but not mandatory.

(3) *Outside Clinical Placement*—Students arrange independent projects with state or federal public interest organizations for academic credit. A compilation of suggested projects available within the Community Legal Clinics office. Projects must receive prior approval by the Director of Clinical Programs or the staff.

(4) *Small Business Clinic*—Under guidance of the instructor, students assist small businesses and non-profit organizations, dealing with a wide variety of problems, including drafting partnership and incorporation papers, drafting and reviewing contracts and commercial leases, advising on tax problems, and resolving disputes. Prerequisite: Law 312 and 313. Permission of the instructor required prior to registration.

The grade *CR* (Credit) or *NC* (No Credit) is given for all sections of this course. (Fall, spring, summer)

347 Insurance (2) Schiller, Pooler

A primary risk-distributing medium and the rules by which legislative, administrative, and judicial bodies seek to promote its benefits and avert its dangers. Includes insurance marketing, insurable interest, subrogation, transfer of insurance benefits to nonpolicyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—day and evening; summer 1981)

348 Domestic Relations (2) Potts, Zaritsky

Marriage, annulment, and divorce; adoption and custody of children; economic relations. (Examination) (Fall—evening; spring—day)

351 Law and Accounting (2) Cibinic, Kempler, Herman, Taubman

Study of fundamental accounting principles with emphasis on corporate accounting; legal and accounting implications of specific items in financial statements of corporations; inventory adjustments; corporate transactions, distributions, capital adjustments. Strongly recommended for students who

have had no accounting. (Examination and Problem Assignments) (Fall—evening; spring—day)

355 **Government Contracts** (3) Nash, Cibinic

Survey of basic law underlying government procurement, basic power and limitations on federal government in entering into contracts, administrative and legislative policies governing these contracts, advertised and negotiated procurement procedures, forms of contracts and clauses used. Law 431 *Government Procurement Law* is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—day)

359 **Patent Law** (2) Kayton

Law of patents subsequent to issuance of patent; nature of patent as property and as a legal instrument; validity—novelty, nonobviousness, utility and enablement; infringement, doctrine of equivalents, and file-wrapper estoppel. Substantive concepts introduced in an order approximating patentee's and infringer's cases in litigation. Designed for students intending to specialize in patent law; knowledge or experience in patent law helpful but not prerequisite. (Examination) (Fall—evening)

362 **Patent Office Practice** (2) Kayton, Henon

Substantive and procedural law of patents leading to issuance of patent, mainly related to proceedings before U.S. Patent Office. Obtaining and preserving earliest possible patent filing date; continuing applications, res judicata, novelty and nonobviousness requirements; substantive rules of priority of invention and related affidavit practice; nature of claims and formal defects; double patenting. Designed for students intending to specialize in patent law. Prerequisite: Law 359. (Examination) (Spring—evening)

363 **Fraud in Patent Practice** (2) Kayton

Procedural and substantive law of fraud and inequitable procurement in prosecution of patent applications before the U.S. Patent and Trademark Office. "Materiality," "reliance," and "scienter" criteria in fraud controversies; procedures used in motions to strike, and the striking of, patent applications in protests, reissues, and *sua sponte* proceedings of the Patent Office. Analysis of relationships among the New Reexamination Statute, Protests, the proposed Inter-Partes Protests, and the new-prior-art Reissues relative to fraud. For students intending to specialize in patent law. Prerequisite: Law 359 and 362. (Examination) (Fall—evening)

372 **Administrative Law** (3) Park, Banzhaf, Barron, Schwartz, Raven-Hansen

Study of the administrative process in executive and independent regulatory agencies; emphasis on judicial review. Formal and informal decision-making, investigation, planning, and public administration functions of the agencies as related to their legal limits and to the roles of lawyers in government and private practice. Relationships of agencies to the executive and legislative branches, to public and private interest groups, and to the social, political, and economic aspects of various philosophies of government regulation. Park and Banzhaf—(Examination) (Fall—day; spring—day and evening; summer 1981)

375 **Remedies** (3) Cibinic, Nash, Lowther, Park, Zubrow, Shreve

Development and use of judicial remedies that give relief for past or threatened injuries to interests of personalty and property. Remedial ap-

proaches include compensatory and punitive damages, injunctions, unjust enrichment, constructive trusts, equitable liens, tracing, subrogation, and specific reparation. Emphasis on comparing remedial options in fraud, mistake, duress, breach of contract, and abuse of fiduciary relationships. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Cibinic—(Examination); Lowther, Nash—(Problem Assignments) (Fall—day; spring—day and evening; summer 1981)

Zenoff

377 Legislation (2)

Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination)

Pryor, Ryan, Kendrick, McMullin, Skinker, Stevas, Altshuler, Nunzio, Seidel

385 Trial Practice Court (2)

Trial of assigned cases, trial techniques, pre-trial and courtroom procedures pursuant to federal rules. Students may repeat this course once for credit. Prerequisite: forty-two semester hours, including Law 218. Prerequisite or concurrent registration: Law 232. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—day and evening)

Hirsh

389 Medicine for Lawyers (2)

Survey of the basic medical sciences and the rudiments of clinical medicine as encountered in the practice of law. Medical terminology, the disease process, trauma, and industrial medicine. The application of this fundamental information is demonstrated in personal injury or negligence and malpractice litigation as well as in commitment and equitable proceedings. Students may witness autopsies at the D.C. Medical Examiner's Office, surgery at George Washington University Hospital, and medical rounds at D.C. General Hospital. Emphasis on enabling the lawyer to communicate most effectively with medical specialists. (Examination) (Fall and spring—day)

Sharpe, Fiscina

390 Law and Medicine (2)

Malpractice, insurance, and alternatives to professional liability litigation; securing and presenting medical evidence to prove causation and damages; chemical test data and behavioral science findings in court; entry into and practice of the professions; professional organizations; hospitals; professional service delivery; public policy intervention in medical science—for example, abortion, transplantation, and coerced treatment. (Examination) (Fall—evening)

Dean

391 Federal Indian Law (2)

Survey of the federal laws, regulations, and policies applicable to American Indians because of their status as Indians, including a review of the development of the fundamental legal doctrines (tribal sovereignty, federal supremacy in Indian affairs, the guardian-ward relationship, the trust responsibility) and the current legal status of tribal governments in the federal system. Special emphasis on current trends and conflicts in federal Indian legislation and policy, such as the implementation of the Indian Self-Determination and Education Assistance Act and the Alaska Native Claims Settlement Act, congressional programs of economic assistance to Indian tribes, tribal-state jurisdictional conflicts, and questions involving the protection and development of Indian resources. (Examination) (Fall—evening)

394 **Women and the Law** (2) Hunter, Polikoff

An examination of the treatment of women in all areas of the law and of legal remedies for sex discrimination. Emphasis on constitutional law, criminal law, discrimination in the media, education, and employment. Students choose clinical projects or research papers on which to focus the semester's work. Enrollment limited to 30 students. (Research Paper) (Spring—day)

396 **Legal Activism** (2 or 3) Banzhaf

Study of the legal process, not to benefit individual clients, but as a powerful tool for affecting social change and advancing the public interest. Topics discussed in a 2-hour seminar meeting each week include principles of maximizing legal leverage, legal judo, guerrilla law, working with the press and Members of Congress, drafting of legal documents, unusual legal tools and tactics, negotiation, making money from public interest law, etc. Students may choose to bring a public interest legal action before an agency and/or in court, or undertake another legal action project, for 3 credits and receive a numerical grade. Alternatively, students may do research on a topic related to public interest law for 2 crdits on a *CR/NC* basis. (Fall—day)

397 **Disabled People and the Law** (2) Banzhaf

Examination of those areas in which persons with disabilities have traditionally been denied some right or benefit afforded other persons in our society, and have resorted to legal action; introduction to statutes and agencies designed to protect people with disabilities. Students may choose to prepare a research paper (and receive legal writing credit and a numerical grade) or to gain practical experience doing a clinical project (on a *CR/NC* basis). (Spring—day)

398 **National Center for Law and the Deaf Clinical Education Activities** (1, 2, or 3) Banzhaf

Work with the National Center for Law and the Deaf in bringing legal information, services, and representation to the more than 13 million Americans who are deaf or hearing-impaired. The Center is designed to help make the hearing-impaired aware of their legal rights and to assist them in solving their legal and law-related problems. Students may participate in one or more projects: (1) counseling persons with hearing impairments about legal problems at a walk-in clinic usually held on the Gallaudet College campus; (2) preparing and participating in workshops for hearing-impaired persons to acquaint them with their rights and obligations under the law; (3) assisting in representing the interests of deaf and hearing-impaired persons in judicial and administrative proceedings; (4) preparing research papers on topics related to law and the deaf, or preparing handbooks explaining legal topics to the hearing impaired. Students may learn some sign language, but will be assisted by trained translators when dealing with deaf individuals. Approximately 60 hours of work per semester is required for each credit hour. Students may repeat this course for a maximum of eight semester hours of credit. This course may not be taken at the same time as Law 345, or any litigating activities in Law 346. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

399 **Clinical Law Work** (arr.) Staff

Projects involving litigation, research, or public interest activities of a legal nature (including aid to indigents, support of public interest non-

profit corporations, and support of governmental agencies or courts) may be initiated and will be supervised by a faculty member. Projects must be approved in advance by the Law Center Supervisory Committee (three members) both as to whether the project is appropriate and as to the number of semester hours of credit to be granted. A maximum of 10 semester hours of credit may be taken in one or two semesters. This course is open to a limited number of third-year law students. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

CLINICAL LEGAL STUDIES

Director: E.S. Sirulnik

Faculty Advisors: D.P. Rothschild, E.S. Sirulnik, R.B. Stevenson, J. Banzhaf III, A.W. Reitze

Related Courses

343 *Law Students Civil Rights Research Council (LSCRRC)*
345 *Law Students in Court*
346 *Legal Aid*
396 *Legal Activism*
398 *National Center for Law and the Deaf*
399 *Clinical Law Work*
459 *Problems of the Consumer*
513 *Environmental Litigation*
516 *Clinical Studies in Environmental Law*
579 *Clinical Studies in Urban Law*
596 *Graduate Clinical Studies*

Advanced Courses

ADMINISTRATIVE LAW: ECONOMIC REGULATION

Faculty Advisers: R.E. Park, G.E. Weston

403 **Public Economic Policy and the Law** (2) Peterson

Interrelation of law and economics in such subject-matter categories and decisional contexts as economic regulation of industry, fiscal policy planning, government research and development practices, foreign trade and investment, and public spending priorities. (Research Paper) (Spring—evening)

404 **Securities Regulation** (2) Stevenson, L. Cohen, Black, McCaw, Moody

State and federal laws governing offering and distribution of securities to the public by corporate issuers and others, regulation of securities markets, rights and liabilities of purchasers under such statutes. Emphasis on statutes administered by Securities and Exchange Commission. (Take-home Examination) (Fall—evening; spring—day)

405 **Regulation of Securities Markets** (2) Pitt, Sonde

Operation of over-the-counter and exchange markets, including competitive and monopolistic practices in each market; relationship of antitrust laws and securities regulations to concept of a free and open market place; role of regional exchanges and third market in providing competitive element in market; advantages and disadvantages of a fragmented market

minimum fee structure; rebates and their effect on merchandising of securities and financial soundness of industry; use and availability of economic data in evaluating performance of market place. The seminar will examine matters directly of interest to graduate law students, lawyers, economists, and political scientists. (Take-home Examination) (Spring—evening)

406 **Regulation of Securities Trading** (2) Stevenson, Moody

Study of the portions of the Securities Exchange Act of 1934 directed toward the regulation of the trading of securities, including Section 16(b), Rule 10b-5, and the regulation of tender offers. Substantive aspects of these various statutes and rules and enforcement by the SEC and in private actions. Some time may also be spent on the regulation of investment companies. (Examination) (Spring—day)

407 **Seminar: Law and Economic Development** (2) Stevenson

An investigation of legal problems relevant to economic development in the Third World. Economic aspects of economic development, principal issues relating to the impact of domestic laws on economic development, private legal aspects of transactions that may assist in economic development, and some of the principal policy issues in the so-called North-South dialogue. Discussion of student research papers may play a major role in the organization of the class. (Research Paper)

411 **Administrative Practices and Procedures (Food and Drug Administration)** (2) Rothschild, Chasen

The study of FDA administrative procedures for the purpose of investigating the significance that administrative practice has on regulatory activity. The course will consider FDA rulemaking procedures in general, a step-by-step consideration of the various hearing procedures now available under the new agency practices and procedures, and problems designed to enable the practical application of rulemaking and hearing procedures to achieve resolution. Prequisite: Law 372. (Research Paper) (Fall—evening)

412 **Food and Drug Law** (2) Kaplan, Becker

The Federal Food, Drug, and Cosmetic Act, and related laws. Consumer, government, and industry viewpoints. (Choice of Research Paper or Examination) (Spring—evening)

413 **Public Policy and Mass Media** (2) Barron, Secrest

Institutional structure of mass media and their interrelationships; psychological aspects of mass communications; continuing adjustments among public interest goals, the economic system, and technological developments; influence of and controls exercised by government, other institutions, and private groups; conflict between freedom of speech of the media and other major community interests; the media's relationships to the interests of dissident and minority groups and the access of these groups to the media. Barron—(Examination or Research Paper); Secrest—(Research Paper) (Fall—day; spring—evening)

414 **Regulated Industries** (2) Park, Schechter

Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review. Each student

selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper) (Spring—day)

415 **Practical Economics for Lawyers** (2) Raven-Hansen

For students with no prior economics training. No calculus or statistics is required. Key principles of economic theory are presented, with focus on the application of these principles to antitrust, regulatory impact analysis (including environmental cost/benefit analysis), utility ratemaking and regulation, and deregulation. The course also considers preparation and examination of economic expert witnesses in these areas of the law. (Examination) (Spring—evening)

417 **Seminar: Trade Regulation** (2) Weston, Bodner

Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper) (Spring—evening)

Master of Laws candidates in the area of Administrative Law: Economic Regulation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
372 *Administrative Law*

Other Related Courses

505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
518 *Use and Control of Nuclear Energy*
571 *Land Development Planning*

CORPORATION LAW

Faculty Advisers: R.B. Stevenson, Jr., L.D. Solomon

424 **Business Planning** (2) Stevenson, Flyer, Lewis, Berkeley, Press

Integrated study of corporate, financial, tax, accounting, and SEC aspects of the following: organization of a small corporation; organization of a public corporation; stock dividends, recapitalization, and stock repurchases in the context of conflict between active stockholders of a closed corporation and the family of a deceased active stockholder; corporate liquidations; corporate mergers and acquisitions; and divisions of corporations. Prerequisite: Law 312, 336, and 340. Enrollment may be limited by the professor. Stevenson, Berkeley, Press—(Problem Assignments); Flyer, Lewis—(Examination) (Fall and spring—evening)

426 **Introduction to International Economic Law** (2) Stevenson, Jones

Principles and processes of international law relevant to transnational economic transactions between private parties, including protection of aliens (individual and corporate) within national legal systems; protection by states of the economic interests of their nationals; act of state doctrine, expropriation, and the protection of alien-owned property; development of international law affecting transnational economic transactions through the decisions of national tribunals and through treaties and international agreements, adjudicatory jurisdiction of municipal tribunals and the

forcement of foreign judgments in the international context; international commercial arbitration; special problems of national and international regulation of transnational business transactions. Law 426 is recommended as a foundation for Law 427. (Examination) (Fall—day)

427 **Legal Aspects of International Business Transactions** (2) Stevenson, Goldstein, Iwry

U.S. law and practice relating to the formation and dissolution of international business agreements; brief treatment of other common and civil law systems, multinational codes, and multilateral agreements; U.S. and developing country regulation of foreign investment; concession, licensing, distributorship, and financial agreements; sources of finance; transnational reach of U.S. legislation, including taxation, antitrust, foreign payments; protection of foreign investment, exhaustion of local remedies and espousal; nationalization of investments; sovereign immunity; litigation in a transnational setting, including choice of law and forum, jurisdiction, discovery, enforcement; arbitration. Occasional guest lecturers. Emphasis on current problems. Stevenson—(Choice of Research Paper or Examination); Goldstein, Iwry—(Examination) (Fall—evening)

Master of Laws candidates in the area of Corporation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

312 *Corporations*
313 *Sales and Sales Financing*
329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
340 *Taxation—Federal Income, Corporations and Shareholders*

Other Related Courses

331 *Product Liability*
403 *Public Economic Policy and the Law*
406 *Regulation of Securities Trading*
407 *Seminar: Law and Economic Development*
417 *Seminar: Trade Regulation*
431 *Government Procurement Law*
525 *Copyright Law*
526 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*
555 *Taxation—Special Corporation Problems*
562 *Income Taxation of Foreign Business and Investment*

GOVERNMENT PROCUREMENT LAW

Faculty Advisers: J. Cibinic, Jr., G.J. Ginsburg, R.C. Nash, Jr.

431 **Government Procurement Law** (4) Nash, Cibinic

Survey of the law pertaining to government procurement, including an analysis of the unique features of government contracting and a discussion of the functions of Congress, the executive branch, and the courts in the procurement process. The course focuses on the contract formation process, including techniques for awarding contracts and litigation and protests involving awards. Law 355 is the substantial equivalent of this course. (Examination and Problem Assignments) (Fall—evening)

432 **Performance of Government Contracts** (4) Nash, Cibinic

Discussion of the substantive problems that most frequently arise during the performance of government contracts. Interpretation of specifications and the most generally used contract clauses, and analysis of the rights of the parties when performance in accordance with the terms of the contract is not obtained. Analysis of the methods which can be used by the parties to a government contract to obtain legal relief, including detailed coverage of the disputes procedure, actions for breach of contract, and forms of equitable and extraordinary relief. (Examination and Problem Assignments) (Spring—evening)

435 **Seminar: Government Contracts** (2) Nash, Cibinic

Research and discussion of selected problem areas. (Research Paper) (Spring—day)

Other Related Courses

424 *Business Planning*
427 *Legal Aspects of International Business Transactions*
442 *Labor Standards*
446 *Equal Employment Opportunity*
450 *Equal Employment Claims and Litigation*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
518 *Use and Control of Nuclear Energy*
535 *Negotiation: Concepts and Techniques*

LABOR LAW

Faculty Advisers: J.M. Albert, L.S. Merrifield, D.P. Rothschild

440 **Seminar: Comparative Labor Law** (2) Merrifield

A comparison of different systems for the regulation of labor and industrial relations in selected countries. Group study of how common problems are handled under these systems; topics may include legal status of collective agreements, worker participation in decision-making, limits on bargaining weapons, procedures for settlement of grievances and jurisdictional disputes, protection against unfair dismissal, and reconciliation of individual, minority, and majority group interests. (Research Paper)

441 **Seminar: Disability Problems** (2)

Workman's compensation law, extension of no-fault principle into motor vehicle area, and national health problems. (Examination)

442 **Labor Standards** (2) Ginsburg

Analysis of the Fair Labor Standards Act, its scope and exemptions, the Civil Rights Act and other labor statutes; the laws establishing labor standards for government contracts, including the Davis-Bacon Act, Walsh-Healey Act, Service Contract Act, and Work Hours Act; the role of the Department of Labor, the Comptroller General, and the contracting agencies in interpretation, administration, and enforcement of these statutes. (Examination) (Spring—evening)

443 **Labor Relations in the Federal Service** (2) Tobias

Study of the Civil Service Reform Act, with emphasis on the structure and case law developed by the Federal Labor Relations Authority, Federal Service Impasses Panel, and Merit Systems Protection Board. Parallels

are drawn between federal sector, non-federal public sector, and private sector decisions. (Research Paper) (Fall—evening)

445 **National Labor Relations Board Procedures** (2) DuRoss

A survey of the National Labor Relations Board's unfair labor practice procedures. The course is designed to provide a broad exposure to all aspects of the National Labor Relations Board's practice, including a survey of the remedies and the particular procedures utilized by the National Labor Relations Board to secure such remedies. Prerequisite: a basic labor law course. (Research Paper) (Fall—evening)

446 **Equal Employment Opportunity** (2) Silberman

This course covers the spectrum of federal laws and executive orders relating to all types of discrimination in employment, including Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972; the Equal Pay Act of 1963, as amended in 1972; the Age Discrimination in Employment Act; the Civil Rights Act of 1866; the Fourteenth Amendment; the National Labor Relations Act; Executive Orders 11246 and 11375 relating to government contractors (including the "Philadelphia Plan" and other government-imposed "affirmative action" plans and bid conditions, and Revised Order No. 4 relating to sex discrimination). The course includes the substantive and procedural rights available to employees of firms doing business with the government, as well as those of other private firms and state and local government agencies subject to the above federal legislation. (Examination) (Fall—evening)

447 **Seminar: Labor Law** (2) Merrifield

Group study of contemporary problems of labor law. Prerequisite: Law 341. (Research Paper) (Spring—day)

448 **Seminar: Labor Litigation** (2) Driesen

Examination of the Supreme Court's work in the labor law field, with emphasis on current and recently decided cases. Facets of Supreme Court practice and procedure that bear upon labor litigation; litigation strategies and objectives of institutions and practitioners who practice labor law before the Supreme Court. Each student will study intensively the labor relations opinions of an individual Justice, followed by participation in a mock conference of the Justices on a pending or recent case and preparation of a paper analyzing the Justice's views on important labor law issues. Prerequisite: Law 341. (Research Paper) (Spring—evening)

450 **Equal Employment Claims and Litigation** (2) Hartman

Litigation in federal court of a claim of employment discrimination; problems faced by attorneys for both plaintiff and defendant; practice in drafting pleadings which the attorneys for the parties would prepare in litigating a claim of employment discrimination. (Examination) (Spring—evening)

451 **Occupational Safety and Health Legislation (OSHA)** (2) Savelson

This course will review the history of safety and health law in the United States and present an analysis of the interrelationship of various federal and state safety and health laws. The focal point will be the Occupational Safety and Health Act of 1970. By use of commission and court decisions, the course will survey the jurisdictional applicability of the Act and the responsibilities imposed thereunder, and will present an analysis of enforcement and adjudicative procedures. (Examination) (Fall—evening)

452 **Seminar: Public-Sector Labor Law** (2) Nassau

Group study of contemporary problems of labor law. The course is devoted exclusively to problems of the public sector. (Research Paper) (Spring—evening)

Master of Laws candidates in the area of Labor Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

339 *Collective Bargaining and Labor Arbitration*
341 *Labor Law*

Other Related Courses

459 *Problems of the Consumer*
460 *Current Problems in Civil Rights*
566 *Taxation—Deferred Compensation II*

LAW AND POVERTY

Faculty Advisers: D.P. Rothschild, J.E. Starrs

459 **Problems of the Consumer** (arr.) Rothschild and Staff

(1) *Consumer Protection Center*—Clinical treatment of consumer protection. Students engage in one or more of a number of the Center's projects. For example, "Contact 4" is a project which solves problems received in writing for an Emmy Award-winning nightly television show. "Consumer H-E-L-P" places students in telephone contact with inner-city consumers. The cluster intern program places law students with the District of Columbia Office of Consumer Protection. The Center's federal programs allow students to gain experience in regulatory agencies. Students may also write and publish in the *Consumer Protection Reporting Service*. Minimum of eight hours work commitment each week; two-hour weekly seminars required in addition for 3 credits. May be repeated once for a total credit not to exceed six hours.

(2) *Bankruptcy Clinic*—Open to second- and third-year students. Students participate in negotiations with creditors, counsel clients in financial matters through intensive interviews, and prepare legal petitions in bankruptcy that may be necessary to assist clients. May be taken for two or three credits. One and one-half hour weekly seminar.

The grade *CR* (Credit) or *NC* (No Credit) is given for both sections of this course. (Fall and spring—day; summer 1981)

Other Related Courses

441 *Seminar: Disability Problems*
475 *Law and Criminology I: Search for the Causes of Criminal Behavior*
476 *Law and Criminology II: Society's Responses to the Criminal Offender*
560 *Taxation—State and Local*
571 *Land Development Planning*
575 *Community Economic Development*
592 *Seminar: Constitutional Law*

LAW, PSYCHIATRY, AND CRIMINOLOGY

Faculty Advisers: T.F. Courtless, Jr., E. Zenoff, G.M. Caplan

473 **The Crime Lab, the Forensic Scientist, and the Criminal Lawyer** (2) Starrs, Melson

Designed to acquaint the student with the operations of a modern crime laboratory and the courtroom acceptability of testimony of forensic scientists and other evidence on laboratory test results. Identification of individuals (fingerprints, palmprints, footprints, voiceprints, anthropological reconstruction, hair identification, and serology), identification of objects (ballistics, handwriting, typewriting, fiber identification, paints, varnishes, glass, wood, and paper), toxicology, pathology, forensic use of the microscope and the camera, the coroner and the medical examiner systems, and drug law enforcement. Visual aids, crime laboratory guest lecturers, and field trips to crime laboratories. (Research Paper) (Spring—day)

475 **Law and Criminology I: Search for the Causes of Criminal Behavior** (2) Courtless

Role which criminological knowledge of crime causation may play in assisting lawyers to appraise the effectiveness of various alternative social and legal devices in controlling deviant behavior. The search for factors related to criminal behavior will be developed historically, with emphasis on current causal theories developed by various disciplines. Model as well as operational penal codes, sentencing and probation practices, and specialized facilities will be analyzed in terms of their relationship to such casual theories. (Research Paper) (Fall—day)

476 **Law and Criminology II: Society's Responses to the Criminal Offender** (2) Courtless

Study of the development and current use of society's three major approaches to the handling of offenders: punitive, mechanical, and correctional. Emphasis on society's changing responses to criminal and delinquent behavior, and research findings concerning effectiveness of these responses. Analysis of treatment strategies to facilitate communication between members of the legal profession and behavior scientists charged with effectuating these strategies. Prerequisite: Law 475. (Research Paper) (Spring—day)

477 **The Police and the Community** (2) Courtless

Problems and potential of contemporary urban law enforcement; the role and perspective of the police officer; the police *qua* organization; "styles" of law enforcement; law enforcement in the inner city; relationship with ethnic minorities; civil disorder; police-community relations; methods in arrest and investigation; complaint review procedures; science and technology in law enforcement; police handling of juveniles; crime and crime statistics. (Problem Assignments)

479 **Seminar: Criminal Practice** (2) Foster, Weisberg

Tactical and practical applications of criminal law; mastery of techniques in trying criminal cases. Class sessions built around mock problems based on actual criminal cases; student role-playing as defense attorneys and prosecutors. All phases of criminal trial work covered—client relations, investigation, discovery, trial preparation; particular emphasis on courtroom techniques—direct and cross examination, impeachment, refreshing recollection, laying foundations for exhibits, argument, and courtroom demeanor. Though many of the mock problems are written from a defense viewpoint, techniques taught are relevant to both prosecution and defense. Enrollment limited to 15 third-year and graduate students. Prerequisite: Law 334. Students may elect to receive either a numerical grade or the grade *CR* (Credit) or *NC* (No Credit). (Fall and spring—evening)

480 **Law of Criminal Corrections** (2) Cripe

Study of two principal areas: (1) sentencing procedures, including probation, parole, and imprisonment; (2) legal rights of prisoners. Enrollment limited to 25 students. (Examination) (Fall—evening)

481 **Seminar: Drugs and the Law** (2) Sirulnik

A study of federal and state laws controlling illicit drugs, including the historical evolution of these laws, current offenses and penalties, constitutional limits on the criminal sanction, enforcement practices, and sentencing considerations. Alternative models for controlling drugs, including decriminalization and legalization. Five class sessions will be devoted to mock criminal trials at which student teams conduct direct and cross-examination of guest expert witnesses in the field. Graded on the basis of assigned memoranda pertaining to the legal issues involved in the mock hearings. (Writing Assignments) (Spring—day)

485 **Seminar: Health Care Delivery Systems** (2) Steele

Study of the role of the lawyer in existing and proposed national systems for delivering health care. Students will gain familiarity with the concepts and terms in health care delivery by working with issues in the design, finance, and administration of existing arrangements; examination of the means of reconciling the expectations of various groups of health care service consumers and providers. (Research Paper) (Spring—evening)

486 **Seminar: Law and Psychiatry** (2) Zenoff, Strathman

Designed to expose the lawyer to basic constructs of psychiatry and psychology and to explore their implications in legal rules and practice. Psychiatrists and psychologists actively involved in teaching process. Topics include psychological testing and other assessment techniques, psychiatric evaluations and reports, child custody and other family law issues, privilege and confidentiality, competency in civil and criminal contexts, criminal law matters (including criminal responsibility and dispositional issues), civil commitment, right to treatment, right to refuse treatment, experimental procedures, and informed consent. Problems of counseling, legal ethics, preparation for trial, direct and cross examination, and other aspects of practice considered. There is ordinarily at least one session in a mental institution. (Choice of Research Paper or Examination) (Spring—day)

487 **Juvenile Justice** (2) Zenoff

Exploration of the rights of children in intra-family disputes and in conflicts between the child and the state. Includes the rights of children to life (abortion and medical care), a home (neglect and adoption), education, liberty (status offenses, delinquency, hospitalization for mental disability). (Research Paper)

Other Related Courses

390 *Law and Medicine*
591 *Legislative Drafting*
592 *Seminar: Constitutional Law*

LAND USE MANAGEMENT AND CONTROL

Faculty Advisers: J.M. Brown, L.A. Schiller, J.P. Chandler

501 **Land Development Law** (3) Brown

Study of the basic public and private means used by society to manage and control land use, such as zoning, subdivision regulation, pending codes, eminent domain, and privately contracted conditions, covenants, and restrictions. Identification and analysis of emerging new land control processes and the roles played by public and private entities involved in or affected by land use management and control efforts at the various echelons of government. Students participate in a game-simulation process representing a specific complex situation in land use conflicts involving their inherent technological, social, economic, political, and legal elements. In the model situation students will assume roles as attorneys and work with assigned "clients." (Client-oriented written work and class participation.) Enrollment limited by the instructor. (Fall—day; summer 1981)

504 **Seminar: Current Problems in Land Use Controls** (2) Brown, Schiller

New and emerging concepts of regionalism considered in the light of actual problem situations and attempts being made by various echelons of government to provide effective and equitable land use management and control. Examination of actual problem areas of major concern, including constitutional, administrative, political, judicial, social, economic, and technological elements. Functional planning and decision-making with respect to selected problem areas and their strategical and tactical transactions examined within the compass of the broader policy considerations involved. Guest lecturers; clinical exposure to various government agencies responsible for cooperating with the selected problems. (Research Paper) (Spring—day)

505 **Intergovernmental Relations I** (2) Nash

Study of federalism, emphasizing current techniques for achieving cooperation and coordination between federal, state, and local governments. Detailed consideration of devices used, including interstate compacts, grants-in-aid, and exercise of regulatory powers. (Research Paper) (Fall—day)

506 **Intergovernmental Relations II** (2) Nash

Advanced seminar on multi-government activities and current topics on intergovernmental relations. (Research Paper)

Master of Laws candidates in the area of Land Use Management and Control who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

327 *Modern Real Estate Transactions*
372 *Administrative Law*
508 *Environmental Law I*
509 *Environmental Law II*

Other Related Courses

460 *Current Problems in Civil Rights*
518 *Use and Control of Nuclear Energy*
558 *Taxation—Real Estate and Income*
560 *Taxation—State and Local*
591 *Legislative Drafting*
593 *Seminar: American Legal History*

ENVIRONMENTAL AND ENERGY LAW

Faculty Adviser: A.W. Reitze, Jr.

508 **Environmental Law I** (3) Reitze

A survey of the laws administered by the U.S. Environmental Protection Agency—water pollution, noise, toxic substances, etc. An in-depth analysis of the Clean Air Act, using that Act to focus on legal problems common to environmental law. (Examination) (Fall—day; spring—evening)

509 **Environmental Law II** (3) Reitze

A continuation of Law 508. Topics covered in this course vary. (Examination)

510 Water Resources Law (2) Hedeman

Federal/State powers over water; riparian and prior appropriation doctrines; Indian and reserved rights; groundwater law. Federal programs for water resources development; federal permit programs. Wetland protection and coastal zone management. (Examination) (Fall—evening; summer 1981)

511 Environmental Planning (2) Schnidman

Introduction to environmentalism in land use planning, zoning, subdivision controls, growth control. State and federal land use planning. Case studies of environmentally sound planning. Enrollment limited to 25 students. A second-level property course is recommended prior to this course. (Research Paper) (Fall—evening)

512 **Energy** (2) Hollis

Survey of federal energy regulation of the major energy industries. Emphasis on federal controls affecting the oil, natural gas, coal, and electric industries. The course approaches energy regulation from a statutory and case standpoint, and also deals with practical, procedural issues. Enrollment limited to 35 students. Recommended for third-year students. (Examination) (Fall—evening)

513 **Environmental Litigation** (2) Miller, Vitt, Walsh

Special problems of environmental lawsuits. Topics include pleadings, procedural problems, selection of the proper court, problems of proof, remedies, selection of parties, discovery techniques and trial preparation, and the use of expert witnesses and scientific evidence. Prerequisite: third-year or graduate status. Enrollment limited to 35 students. (Writing Assignments) (Spring—evening)

514 **Natural Resources Law** (2) Kirby, Sheldon

Introduction to public lands; recreation, forestry, grazing, and mining law. Continental shelf development, Alaskan development, western energy development. Wilderness Act, wild and scenic rivers, national trails. Wildlife issues are a major focus of the course. Recommended for second- or third-year students. (Examination) (Fall—evening)

515 **Water Pollution Control Law** (2)

A detailed analysis of the Federal Clean Water Act. Other federal statutes with water pollution implications are examined, including the Marine Protection, Research and Sanctuaries Act, Ports and Waterways Safety Act, Outer Continental Shelf Lands Act, Deepwater Ports Act, and Safe Drinking Water Act. Recommended for second- or third-year students. (Examination) (Spring—day)

516 **Clinical Studies in Environmental Law** (2, 3, or 4) **Reitze**

The student works on a project in the environmental law field under the supervision of both the faculty director of the program and a lawyer practicing environmental law. The project may involve working with a government agency, a congressional committee, a private practitioner, or a nonprofit public-interest environmental organization. Admission to this course requires second-semester second-year, third-year, or graduate standing and permission of the Director of the Environmental Law Program. Students who have mastered the fundamentals of environmental law are selected for this course. Normally this will require completion of at least Law 508. Students may repeat this course for a maximum of 8 semester hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. Five hours of work per week are required for each credit. (Fall and spring—day)

518 **Use and Control of Nuclear Energy** (2) Malsch

Development of law and legal institutions to deal with scientific developments in nuclear energy. Laws and regulations concerning peaceful uses of nuclear energy, including licensing, safety, environmental, security, and antitrust considerations. (Research Paper) (Spring—evening)

Master of Laws candidates specializing in Environmental Law or Land Use Management and Control may use the following courses to complete the degree requirements.

598 *Research in Public Law*
599–600 *Thesis*

Other Related Courses

327 *Modern Real Estate Transactions*
413 *Public Policy and Mass Media*
431 *Government Procurement Law*
451 *Occupational Safety and Health Legislation*
501 *Land Development Law*
504 *Seminar: Current Problems in Land Use Controls*
532 *International Law of the Sea*
560 *Taxation—State and Local*
572 *Land Development Planning*
591 *Legislative Drafting*

PATENT AND TRADE REGULATION LAW

Faculty Advisers: I. Kayton, G.E. Weston

522 **Patent and Know-how Licensing** (2) Brunsvold

The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that

permit a proprietor of intellectual property to effectively exploit his status as the owner of a unique form of property. Subject areas covered are business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 359. (Choice of Research Paper or Examination) (Spring, odd years—evening)

523 **Court Review of Patent Office Decisions** (2) Dunner

Procedure and procedural law involved in appealing to the U.S. Court of Customs and Patent Appeals and the U.S. District Courts from administrative decisions in the U.S. Patent Office. Designed to provide an exhaustive step-by-step procedural progression through *ex parte* and *inter partes* patent and trademark appeals. Emphasis on the forms used in the many motions and proceedings before the U.S. Court of Customs and Patent Appeals and the District Courts required to perfect an appeal. Attendance at and critique of actual court proceedings. Introductory material includes administrative appeals before the U.S. Patent Office Board of Appeals. Prerequisite: Law 359 and 362, or the equivalent in experience. (Examination) (Spring—evening, even years)

524 **Chemical Patent Practice** (2) White

Seminar covering patent application preparation, prosecution, appeals, and licensing which are peculiar to chemical patent practice. Prerequisite: Law 359 and 362, or comparable experience in the practice of patent law. (Examination) (Fall, even years—evening)

525 **Copyright Law** (3) Moore

Historical background; formalities and essentials in securing a copyright; subject matter of copyright; remedies; international aspects of copyright under Berne Union, Universal Copyright Convention, Inter-American Convention; copyright licensing and performing rights societies. (Examination) (Spring—evening)

526 **U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks** (2) Hefter

Procedural and substantive law on use, registration, and protection of trademarks, including detailed registration procedure in the U.S. Patent and Trademark Office, common law rights to marks, and licensing and franchising arrangements. Prerequisite: Law 329. (Examination) (Fall—evening, odd years)

528 **Patent Interference Practice** (2) Klitzman

Procedure and practice in inter partes determination of priority of invention in the U.S. Patent Office. Topics: conception, reduction to practice, diligence, corroboration, preliminary statements, motions, and testimony practice and final hearing. Also covered are current problem areas such as inventor determination, discovery, and privilege. Students required to draft procedural document selected from categories of preliminary statements and various interference motions. Prerequisite: Law 359 and 362. (Examination) (Spring 1982—evening; spring of odd years thereafter)

529 **Research in Patent, Trademark, and Copyright Law** (2) Kayton

Prerequisite: Law 359, 362, and related courses; and a *B* average. Request in writing, with proposed outline of topic of research, must be submitted to the Dean at least one month prior to registration day. Work must be completed within the semester and paper submitted not later than last day of classes. Graduate students may repeat this course once for credit with the approval of the Dean. (Research Paper)

Master of Laws candidates in the area of Patent and Trade Regulation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
359 *Patent Law*
362 *Patent Office Practice*

Other Related Courses

417 *Seminar: Trade Regulation*
431 *Government Procurement Law*
589 *Seminar: Law of Privacy*

INTERNATIONAL AND COMPARATIVE LAW

Faculty Advisers: International Law—W.T. Mallison
Comparative Law—G.R. Delaume, W.T. Mallison

The basic courses for the International and Comparative Law Program are:

303 *International Law and World Order*
304 *United Nations Law and World Order*

Either of these courses provides an important background for the following advanced seminars. Law 307, *Comparative Law,* is also recommended for background.

531 **International Law of Air and Space** (2) Dembling, Hosenball

Study of the development of international law relating to the use of air space and outer space; analysis of air and space treaties in force; the role of various intergovernmental and nongovernmental international organizations; consideration of special problems such as liability resulting from space activities, space technology and arms control, and pollution and contamination of outer space; earth resources, sensing, etc. Enrollment limited to 25 students. (Research Paper) (Fall—evening)

532 **International Law of the Sea** (2) Muys, Nordquist

International law affecting allocation of authority over ocean space. Development of international law concerning territorial sea, contiguous zone, high seas, continental shelf, and deep seabed. Current legal and policy issues associated with these areas. (Examination) (Spring—evening)

533 **International Humanitarian Law of Coercion Control** (2) Mallison

Process of legal decision concerning international conflicts and civil wars, including the protection of war victims, control of international terrorism, problems concerning weapons of mass destruction, war crimes and punishment, and problems of preserving human and material values by transforming coercion situations to minimum order ones. Consideration will

be given to the four Geneva Conventions of 1949 for the Protection of War Victims, the Geneva Protocols of 1977, the role of the International Committee of the Red Cross, and current problems in the application of humanitarian law. (Research Paper) (Spring—day)

534 **U.S. Foreign Relations Law** (2) Chandler

Seminar involving the study of foreign relations law. Materials to be read and discussed relate to the Constitutional and other public law problems which arise in the development and conduct of U.S. foreign relations. (Research Paper)

535 **Negotiation: Concepts and Techniques** (2) Ramundo, Tankel

Roles of the attorney-negotiator and principal (client) in the private, intra-organizational, and international negotiating environments; the "think negotiation" mentality and a suggested conceptualized approach to the negotiation process, including the definition of negotiation, four phases of negotiation, and operational checklists; negotiating techniques, including presentational considerations and the use of persuasion, tactics and ploys, and classic do's and don't's lists; theories of the opening position and concession-making. Practical exercises in the actual conducting of negotiations. Enrollment limited by the instructors. (Writing Assignments) (Spring—evening; summer 1981)

536 **Diplomatic and Consular Law and Practice** (1) Mitchell

Development of diplomatic and consular relations between nations; legal rights, privileges, functions, and immunities of diplomatic and consular personnel; extent of immunity from jurisdiction of foreign government missions and representatives; problems of taxation affecting foreign government missions and personnel. (Research Paper)

537 **The International Law of Human Rights** (2) Fruchterman

Development of the rights of man from Grotius through the American and French Revolutions to the work of the United Nations in the field of human rights: the individual vis-a-vis the State; the regional approach to international protection of human rights, with emphasis on the European Convention; the inter-American, African, and Socialist approaches; human rights in armed conflict; and terrorism as a basic deprivation of human rights. (Research Paper) (Fall—evening)

540 **Choice of Law and Forum in Transnational Contracts, Techniques of Conflict Avoidance** (2) Delaume

Problems confronting the practitioner who endeavors to anticipate conflicts before they arise. Conflicts rules for transnational contracts; internationalization of contracts involving sovereign and international organizations. Techniques of conflict avoidance; express choice of law; conflict avoidance in absence of express stipulation of applicable law. Effectiveness of conflict avoidance; interrelationship of conflicts law and comparative law. (Research Paper)

542 **U.S. Regulation of International Trade** (2) Johnston

Study of theory and practical application of United States laws, regulations, and governmental infrastructure affecting international trade. Public international fora and agreements influencing U.S. regulation, e.g., GATT, the MTN, UNCTAD, and treaties of friendship, commerce, and navigation; constitutional basis for U.S. government regulation of international trade; exemplary areas of trade regulation: Export Administra-

tion Act, foreign assets control, tax, Foreign Corrupt Practices Act, Arab boycott regulations, antitrust, countervailing duties, import relief for domestic industries, East-West trade, generalized system of preferences and tariff nomenclature. (Examination) (Spring—evening)

546 **Soviet Law** (2) Ramundo

Concept of "socialist legality"; legal relationship of individual to state and other participants in Soviet society; role of Party in Soviet legal system; Soviet philosophy of law; state (constitutional) law: Soviet federalism, governmental apparatus, rights and obligations of citizenship; criminal law; property law; labor law; selected topics in civil law and procedure; international law. (Writing Assignments or Examination) (Fall—evening)

547 **Chinese Law** (2) Hsia

Emphasis on the legal system of Communist China; analysis of the constitutional law of China, including general principles, state structure, and rights and duties of citizens; a brief survey of the administration of justice—courts, procuratorates, and lawyers; marriage law; land law; counter-revolutionary act and other criminal statutes; principles of civil law; Communist Chinese concept of international law. (Research Paper)

548 **Law of the Near East** (2) Jabri

Law of the Arab countries, Turkey, and Iran, including basic principles of Islamic law, analysis of the present day codes, and investigation of the Western influences on laws of these countries. (Research Paper) (Spring—evening)

Master of Laws candidates in the area of International and Comparative Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

302 *Admiralty*
303 *International Law and World Order*
304 *United Nations Law and World Order*
307 *Comparative Law*
309 *Conflicts of Laws*

Other Related Courses

427 *Legal Aspects of International Business Transactions*
440 *Comparative Labor Law*
518 *Use and Control of Nuclear Energy*
562 *Income Taxation of Foreign Business and Investment*
586 *Immigration Law*

TAXATION

Faculty Advisers: **J.R. Hambrick, D.B. Weaver, L.D. Solomon**

551 **Taxation—Partnerships and Subchapter S** (2) Weaver, Sanders

Income tax problems of partnerships and tax-option corporations (Subchapters K and S of the Internal Revenue Code of 1954). Practice-oriented study of partnerships, including syndication, organization, and structure of entity, with emphasis on policy examination of areas of IRS principal

concern, including tax shelters, disproportionate tax allocations, retroactive allocations, guaranteed payments to partners, contributions of capital, basis for gain or loss, non-recourse financing, "at-risk" rules, current and liquidating distributions, sale of partnership interests, collapsible partnerships, "like-kind" exchanges, termination, special basis adjustments, and distributions to retiring or deceased partners. Planning-oriented analysis of Subchapter S, including procedures for electing and terminating Subchapter S status, treatment of income and losses, limitations on deductibility of losses, and how to avoid pitfalls. (Examination) (Spring—evening)

552 **Criminal Tax Prosecutions** (2) Rothwacks

Criminal tax statutes; elements of tax crimes; methods of proof; Internal Revenue summonses; privileged material; Department of Justice and Internal Revenue policy considerations; searches and seizures; grand jury procedings; trial problems. (Examination) (Spring—evening; summer 1981)

553 **Seminar: Estate Planning** (2 or 3) Weaver, McCoy, Solomon

Study of the effective disposition of wealth by inter vivos gift and testamentary transfer; emphasis on income, estate, and gift tax considerations; use of the trust form in the transfer of wealth; use of insurance and jointly held property as part of the estate plan; planning for the continuation or disposition of the client's business interests. Preparation of an estate plan, with supporting documents is the major project for the course. Prerequisite: Law 325, 326, 336, and 338. Enrollment limited by the instructors. Solomon, Weaver (Problem Assignments); McCoy (Choice of Problem Assignments or Research Paper) (Fall—evening; summer 1981)

555 **Taxation—Special Corporation Problems** (2) Davis

Detailed study of the principal federal tax benefits of the corporate form of doing business. Consideration of problems involved in the tax planning of the corporate structure and corporate operation, including the tax definition of a corporation, the special deductions available to corporate payers, the compensation of the corporate executive and employee, the debt-equity question, the accumulated earnings tax, the personal holding company tax, multiple corporations, and consolidated returns. Survey of the types of corporations receiving special treatment under the Internal Revenue Code, such as financial institutions, real estate investment trusts, regulated investment companies, cooperatives, and small business corporations. Prerequisite: Law 340. (Research Paper or Examination) (Spring—evening)

557 **Taxation—Exempt Organizations** (2) Hopkins

Tax-exempt organizations: policy and practice of preferred tax treatment for selected organizations and gifts to them. Statutes, regulations, and IRS practice; legislative origins, judicial interpretations, and policy consideration. Tests of qualification, disqualification, and limited tax preference. Mechanics of securing and retaining exemption; qualified exemption; unrelated business income; private inurement, political activity. Denial or loss of exemption. Return and reporting requirements. Comparative tax treatment of nonexempt and nonprofit organizations. Special sanctions with respect to private foundations, managers, and donors for improper, excessive, or prohibited activities. Enrollment may be limited. Prerequisite: Law 336. (Examination)

558 **Taxation—Real Estate and Income** (2) Tucker

The effect of income taxes on the real estate market and real estate transactions: sales and exchange of real estate interests; various entities for the ownership and development of real estate; the impact of taxes on the landlord and tenant; the impact of taxes on the mortgagor and mortgagee, including the choice of financing techniques, such as the sale-leaseback; depreciation, amortization, and obsolescence; basis and basis adjustments; and casualties and other involuntary conversions. Prerequisite: Law 336. (Examination) (Spring—evening)

559 **Taxation—Oil and Gas** (2) Hambrick

Application of federal income tax law to producing segment of oil and gas industry. Classification of interests; treatment of exploration and development expenditures. Depletion allowance and concept of "economic interests." Sales vs. "leasing" transactions. Organization problems. Prerequisite: Law 336. (Examination)

560 **Taxation—State and Local** (2) Drabkin, Field

Taxation by state and local governments; problems of real and personal property taxation, sales and use taxes, business and personal income taxes. Limitations on taxation of interstate commerce. Congressional problems. (Choice of Research Paper or Examination) (Spring—evening)

562 **Income Taxation of Foreign Business and Investment** (2) Hambrick

The provisions and policies of the federal income tax law applicable to foreign income, including considerations affecting the choice of methods of engaging in foreign business and investment, treatment of controlled foreign corporations, allocation of income in foreign commerce, credit for foreign taxes, principles and trends of U.S. tax treaties. (Examination) (Spring—evening)

564 **Seminar: Special Problems of Tax Policy** (2) Sims

Intensive study of selected aspects of the tax structure with primary attention given to the federal income tax. Problem areas are reviewed primarily from the standpoint of tax policy, including legal, economic, social, and practical considerations. Alternative solutions, including current legislative proposals, are examined. Prerequisite: Law 336, 340. (Research Paper) (Fall—evening)

565 **Taxation—Deferred Compensation I** (2) Chabot, Posner, I. Cohen

Tax and labor law consequences of deferred compensation. Examination of new standards imposed by Employee Retirement Security Act of 1974. Consideration of tax consequences of "unqualified" plans, lump sum distributions, individual retirement accounts, and new requirement that defined benefit plans be insured by the Pension Benefit Guaranty Corporation. Prerequisite: Law 336. (Problem Assignments and Examination) (Fall—evening)

566 **Taxation—Deferred Compensation II** (2) Chabot, Klevan, I. Cohen

Nonqualified arrangements: constructive receipt, cash equivalent, I.R.C. §§ 83 and 404, and individual retirement accounts. Qualified plans: deductions, distributions (annuities, lump-sum distributions, rollovers, employer stock), ESOPs, termination insurance, fiduciaries and service providers (reporting, disclosure, fiduciary standards, self-dealing), estate and gift tax, unrelated business income, simplified pension plans, and

master and prototype plans. Law 336 recommended but not required prior to taking this course. Neither a tax background nor Law 565 (formerly Law 554) is prerequisite. (Examination) (Spring—evening)

567 **Seminar: Tax Practice and Procedure** (2) Timbie, Lewis

Review of the major areas of tax practice, including organization of the Internal Revenue Service, legislation, administrative regulations, tax planning, tax rulings, tax audit, settlement procedures, claims for refund, tax collection processes, criminal tax practice, and ethical problems in tax practice. Preparation of various documents is required. Prerequisite: 5 semester hours of taxation, including Law 336. (Problem Assignments) (Fall—evening)

569 **Community Property** (2) Weaver

Comparative study of the marital property law of eight states (Arizona, California, Idaho, Louisiana, Nevada, New Mexico, Texas, and Washington) which derive their law on this subject from Spanish or French civil law sources rather than the common law. Both the traditional concepts and the diverse modern statutory modifications are examined. Specific subjects include questions of classification of property as community or separate, consequences to the spouses, transferees, or creditors of each classification, and special constitutional, conflict of laws, and federal tax questions produced by the community property characterization. (Research Paper or Examination) (Fall—day; offered alternate years)

Master of Laws candidates in the area of Taxation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

336 *Taxation—Federal Income*
338 *Taxation—Federal Estate and Gift*
340 *Taxation—Federal Income, Corporations and Shareholders*
351 *Law and Accounting*

Other Related Courses

404 *Securities Regulation*
424 *Business Planning*
427 *Legal Aspects of International Business Transactions*

URBAN LEGAL STUDIES

Faculty Advisers: M. Pock, D.P. Rothschild

572 **Land Development Planning** (2) Kaufman

Selected problems in urban and regional planning: applications of zoning, urban renewal, and special programs available for the implementation of development plans. Enrollment limited by the instructor. (Writing Assignments and Examination) (Spring—evening)

575 **Community Economic Development** (2) Stevenson

A substantive study of the organizational, financial, and tax-planning aspects of nonprofit, cooperative, and small business organizations. Problems illustrating some of the legal considerations of a nonprofit organization and a small business. Consideration of the problems of economic development and current efforts to stimulate it. Enrollment limited to 25 students. Prerequisite: Law 312, 336. (Problem Assignments)

579 **Clinical Studies in Urban Law** (arr.) Sirulnik and Staff

(1) *Civil Litigation Clinic*—Open to third-year students. Students represent indigent litigants in the Small Claims, Family, Landlord/Tenant, and Civil Divisions of the D.C. Superior Court. Work responsibilities include client interviewing, investigation, settlement negotiations, preparation and argument of motions, as well as conducting actual trials. Two-hour weekly seminar.

(2) *Criminal Appellate Clinic*—Open to third-year students. Students participate in preparing actual criminal cases on appeal, starting with review of trial transcript and culminating with preparation of brief and oral argument before U.S. Court of Appeals for the District of Columbia Circuit. Appellate practice and procedure studied through texts; consultation with appellate judges, law clerks, and attorneys with cases pending on appeal; observation of arguments in the Supreme Court and the Court of Appeals. Two-hour weekly seminar.

For both sections, admission by permission of instructor; students must submit applications during spring term of preceding year. Must be taken for 4 credit hours per term for the entire academic year, or 2 credits carried over both summer sessions. (Fall, spring, summer)

Descriptions for the other courses in this area (listed below) appear elsewhere in "Advanced Courses."

459 **Problems of the Consumer** (2 or 3)
501 **Land Development Law** (3)
505 **Intergovernmental Relations I** (2)
506 **Intergovernmental Relations II** (2)
560 **Taxation—State and Local** (2)

Other Related Courses

460 *Current Problems in Civil Rights*
475 *Law and Criminology I: Search for the Causes of Criminal Behavior*
476 *Law and Criminology II: Society's Responses to the Criminal Offender*
592 *Seminar: Constitutional Law*

OTHER ADVANCED COURSES

585 **Computers and the Law** (3) Chandler

A critical study of selected major legal problems presented by new computer technology, including the impact upon legal doctrine and legal institutions. Jurimetrics, the theory of various uses that are and may be made of computers in legal research, the practice of law, and court administration will be examined. Familiarity with the rudiments of computer science or programming would be helpful, but is not required. (Examination) (Spring—evening; summer 1981)

586 **Immigration Law** (2) Boswell

Law and practice under the McCarran-Walter Act, involving questions of immigration, emigration, expatriation, nationality and naturalization. Consular, Immigration and Naturalization Service, and Labor Department practice. (Examination) (Fall—evening)

587 **Individual Rights and Liberties** (3)

Principles of equality and due process in the 5th and 14th amendments. The power of Congress to enforce the 14th amendment. Focus on individual rights and liberties under the U.S. Constitution. First amendment rights, particularly religion and speech clauses. The right of as-

sociation. Other personal rights in the Bill of Rights. Methodology of judges in deciding cases involving individual rights and liberties, particularly the "balancing test" and the judges' views of societal interests. Prerequisite: Law 212. (Research Paper)

588 **Legal Problems in Education** (2)

Public policy issues involving individual liberties and governmental obligations examined in the context of government's participation in education. Issues covered include legal framework within which states regulate schools, rights of students and teachers, obligations to avoid discrimination and provide equal educational opportunities, and role of courts, legislators, and educational officials in resolving such issues. (Research Paper) Park

589 **Seminar: Law of Privacy** (2)

A review of the law of privacy as it has developed in constitutional litigation, tort law, and state and federal statutes. Current developments and rationales for further expansions of privacy rights are considered. (Research Paper)

591 **Legislative Drafting** (2) Woodman

Advanced instruction and practice in legislative drafting; overview of legislative process with emphasis on legislative drafting. Enrollment limited to 30 students. (Problem Assignments) (Fall—evening)

592 **Seminar: Constitutional Law** (2) Cheh, Dienes

Group study of contemporary problems in constitutional law; process of constitutional litigation; problems of effectuating constitutional guarantees. Limited enrollment. (Research Paper) (Fall—day)

593 **Seminar: American Legal History** (2) Lowther

From the outbreak of the Revolution at Lexington and Concord to the death of John Marshall. An examination of men, events, and movements significant in the unfolding of our laws and legal institutions in this formative period of our national life, including a critical examination of the place of the lawyer in a revolutionary age. Comparison of the role of the lawyer during the politically and socially unsettled time of Marshall with the role of the lawyer in today's troubled scene. Members of the seminar present the results of their research and thought either by oral or written reports. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Problem Assignments) (Fall—as arranged)

594 **Professional Responsibility** (2) Sharpe, Zenoff, Cibinic

Ethical problems in civil and criminal litigation. Loyalty to the client. Financing of legal services. Etiquette of acquiring and retaining clients. Procedures and problems in legal discipline. Special responsibilities of the government lawyer. Ethical conduct of judges. Issues in *pro bono publico* practice. Ethical responsibilities of law professors. Plea bargaining. Role of the American Bar Association. (Examination) (Spring—day and evening)

596 **Graduate Clinical Studies** (1, 2, 3, or 4) Staff

Practical experience in the student's area of specialization or interest. The student may work with a government agency, congressional committee, court, or other such entity performing tasks normally assigned to an attorney. Course approval must be obtained from the student's faculty adviser and/or the Dean. A maximum of four credit hours may be applied toward graduation. For each credit hour, 56 hours of non-remunerated work must be performed. A written report describing in some detail the

specific work performed and evaluating the experience received is required. (Limited to LL.M. candidates.) The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer)

597 **Independent Studies** (arr.) Staff

Limited to teaching fellows. The proposed program of study must be submitted to a faculty member in writing and approved prior to the beginning of the semester. May not be elected for more than 12 semester hours of credit. (Fall and spring)

598 **Research in Public Law** (1 or 2) Staff

Limited to graduate students with at least a *B* average who have had a seminar or comparable course in field of proposed research. Students are responsible for obtaining an adviser from the full-time faculty who is willing to sponsor their research. This adviser's name must be submitted to the Dean at registration. Work must be completed within the semester. Students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall, spring, summer)

599–600 **Thesis** (2–2)

Students must register for two successive semesters and cannot register for both sections in one semester. (Fall, spring, summer)

620–21 **Legal Research, Writing, and Professional Responsibility and Ethics** (1–1)
(For Foreign Students)

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. For credit, a student must attain a minimum grade of 65. No credit will be given for this course unless it is taken both fall and spring semesters. Failure to complete the work in this course will result in a grade of 45. (Fall and spring—evening)

SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

ENVIRONMENTAL AND ENERGY LAW PROGRAM

Director A.W. Reitze

The Environmental Law Program provides course work for J.D. candidates and a specialty LL.M. program for lawyers. The formal course work provides the most extensive coverage in this field of any law school in the nation. At the present time, eleven courses are offered. In addition, there are many related law course offerings, particularly in land use planning, that are available. A clinical program allows students to receive academic credit for internships with government agencies and non-profit environmental litigation groups. Research courses allow students to pursue individual interests under faculty guidance or to participate in faculty research projects.

GOVERNMENT CONTRACTS PROGRAM

Director R.C. Nash, Jr.

A comprehensive government contracts program provides continuing instruction for industry and government personnel in this field and a program of courses leading to the Master of Laws degree in Government Procurement Law. The program includes (1) short seminars, (2) one-week courses in advanced problems in the field, (3) an annual institute treating a problem of contemporary importance, (4) an annual conference in a major area, (5) compilation of materials for use in current courses, (6) publication of a series of monographs treating special problems in the field, and (7) special research projects.

INTERNATIONAL AND COMPARATIVE LAW PROGRAM

Director W.T. Mallison

The objectives of the International and Comparative Law Program are to provide insights, skills, and substantive understanding of international law and foreign legal systems. Specific objectives in international law are to provide an understanding of decision-making, sanction processes, legal institutions, and the relationships between domestic and international law. Specific objectives in comparative law include understanding of the basic institutions of civil law countries, the reception of civil law and common law in non-Western countries, and the role of decisional law and judicial review in selected legal systems. Improvements which are needed to promote the rule of law in the world community are also considered. International aspects of business transactions and economic development are included in the Program. The objectives of the Program are implemented through course work and seminars for both J.D. and post-J.D. degree students and through research and writing in pertinent fields.

LAND USE MANAGEMENT AND CONTROL PROGRAM

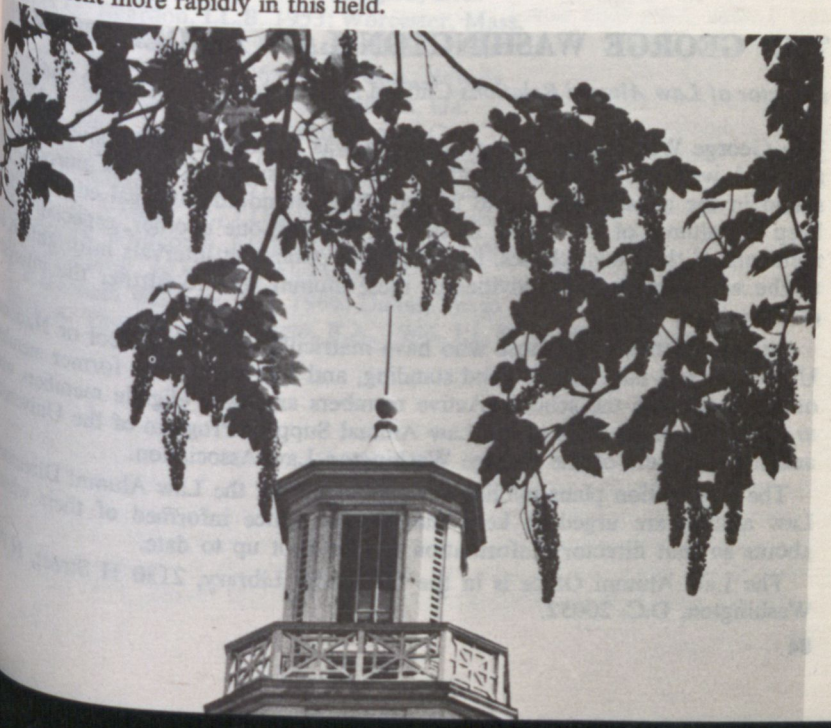
Director J.M. Brown

The social, economic, technological, political, and legal interrelationships generated by the fact that land is a basic, limited-supply natural resource, capable of being subjected to differing but concurrent public and private uses, raise a growing number of issues involving management policy and control measures which are of critical concern to the future of the nation. The Land Use Management and Control Program, through a combination of academic, clinical, and game-simulation processes, seeks to provide an understanding of existing and pending problems, needs, means, and opportunities for solution with respect to this developing area of national concern.

PATENT LAW PROGRAM

Director Irving Kayton

The Patent Law Program is designed for students in the J.D. and Post-J.D. degree programs whose intentions are to specialize in the practice of patent law. During the past eight years an organized program has been developed to offer as complete and as integrated a collection of courses in patent law as possible. The course offerings in patent law now total 17 semester hours, far more than any other law school in the United States. In addition, courses in trademark and copyright law are also available (see the "Patent and Trade Regulation Law" area of specialization in the "Advanced Courses" section of this bulletin for a complete list and detailed description of the patent law courses offered). The object of the Patent Law Program is to provide the student with a concentration in patent law at a level of specialization and maturity which will enable advancement more rapidly in this field.



GENERAL ALUMNI ASSOCIATION

President William M. Porter, M.S. in Adm. 1970

The objectives of this association are to unite the graduates who wish to ass ate themselves for charitable, educational, literary, and scientific purposes, to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the Uni sity and who have left the University in good standing, or any person who i has been a member of the teaching, research, or administrative staff of the U versity, or of the Board of Trustees of the University.

The affairs of the Association are directed by a Governing Board, the jority of whose members represent the constituent alumni organizations of University's schools and colleges.

The voluntary leadership of the Association works closely with the staff the Alumni Relations Office in carrying out Association affairs. The Associat may be contacted through the Alumni Relations Office.

THE GEORGE WASHINGTON LAW ASSOCIATION

Director of Law Alumni Relations Clifford A. Dougherty, J.D.(W.H.) 1964

The George Washington Law Association was founded in 1912 and has be affiliated with the General Alumni Association since 1926. Its purposes stated in the constitution are to promote high standards of legal education, keep the alumni of the school in close touch with one another, especially w members of their own classes, to gather and publish at intervals information to the whereabouts and activities of these alumni, and to further the interes of the school.

Eligible members are those who have matriculated in the school or Nation University and have left in good standing, and any member or former memb of the faculty of the school. Active members are those eligible members w are current contributors to the Law Annual Support Program of the Univers and life members of the George Washington Law Association.

The Association plans publication periodically of the Law Alumni Directo Law alumni are urged to keep the Alumni Office informed of their whe abouts so that directory information can be kept up to date.

The Law Alumni Office is in the University Library, 2130 H Street, N.W Washington, D.C. 20052.

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THE UNIVERSITY

HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as The Colum bian College in the District of Columbia. The name of the institution wa changed in 1873 to Columbian University and in 1904 to The George Wash ington University. The debt of the University to George Washington, whos name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insiste upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from a parts of the country would acquire the habits of good citizenship, throwing o local prejudices and gaining at first hand a knowledge of the practice, as well a the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "to wards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Con gress never extended "a fostering hand." The Potomac Company passed out o existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated min isters and laymen sponsored a movement for the establishment of a college i the District of Columbia. Inspired largely by the zeal and energy of the Rever end Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused ad mittance into said College, or denied any of the privileges, immunities, or ad vantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Flori da Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area contains several reminders of historic interest to the University. Presi dent Monroe, who signed the Charter, lived at 2017 Eye Street. The first Presi dent of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington

selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education, Government and Business Administration, Public and International Affairs; the College of General Studies; the Division of University Students; the Summer Sessions; and the Division of Experimental Programs.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an ex officio member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the International Communication Agency, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the Kennedy Center for the Performing Arts.

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B.S. 1964, Cornell University; J.D. 1967, Georgetown University

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† On leave of absence, academic year 1981-82.

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B.A. 1940, M.A. 1942, Rutgers—The State University; J.D. 1951, George Washington University

Charles Thomas Dienes, *Professor of Law*
B.S. 1961, Loyola University of Chicago; J.D. 1964, Ph.D. 1968, Northwestern University

*On sabbatical leave, fall semester 1981.

Murray Drabkin, *Professorial Lecturer in Law*
B.A. 1950, Hamilton College; LL.B. 1953, Harvard University

George Bennett Driesen, *Professorial Lecturer in Law*
B.A. 1954, Harvard University; LL.B. 1961, Yale University

Donald Robert Dunner, *Professorial Lecturer in Law*
B.S. in Ch.E. 1953, Purdue University; J.D. 1958, Georgetown University

William H. DuRoss III, *Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1968, LL.M. 1971, George Washington University

Thomas Francis Field, *Professorial Lecturer in Law*
B.A. 1954, University of Notre Dame; M.A. 1958, Oxford University; J.D. 1961, Harvard University; LL.M. 1968, Georgetown University

Gerald I. Fisher, *Adjunct Instructor in Law*
B.A. 1972, College of William and Mary; J.D. 1978, Catholic University of America

Salvatore Francis Fiscina, *Professorial Lecturer in Law*
B.A. 1963, Harvard University; M.D. 1967, University of Rochester; J.D. 1973, George Washington University

Michael Richard Flyer, *Professorial Lecturer in Law*
B.A. 1959, LL.B. 1962, University of Michigan

Mark Foster, *Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1971, Harvard University

Richard Louis Fruchterman, Jr., *Professorial Lecturer in Law*
B.S. 1951, J.D. 1954, Georgetown University

Gilbert Jerome Ginsburg, *Professorial Lecturer in Law*
B.A. 1954, B.A. in Law 1955, J.D. 1957, University of Chicago

Corinne Amy Goldstein, *Assistant Professorial Lecturer in Law*
B.A. 1973, Wellesley College; J.D. 1976, University of Michigan

Jackson Reid Hambrick, *Professor of Law*
B.A. 1938, Wofford College; LL.B. 1942, Duke University

Gerald Stuart Hartman, *Professorial Lecturer in Law*
B.A. 1966, M.B.A. 1968, Columbia University; J.D. 1972, George Washington University

Ann Marie Hay, *Adjunct Instructor in Law*
B.A. 1963, University of California, Berkeley; B.S. 1968, University of Minnesota; J.D. 1978, Georgetown University

Anita Kessler Head, *Professor of Law; Librarian of the Law Library*
Lic.Iur. 1955, University of Berne; M.S. in L.S. 1969, Columbia University

William Norman Hedeman, Jr., *Professorial Lecturer in Law*
B.A. 1964, Gettysburg College; J.D. 1968, University of Maryland; LL.M. 1972, George Washington University

Laurence R. Hefter, *Professorial Lecturer in Law*
B.M.E. 1957, M.S.M.E. 1960, Rensselaer Polytechnic Institute; J.D. 1964, George Washington University

Paul Joseph Henon, *Professorial Lecturer in Law*
B.E.E. 1960, Georgia Institute of Technology; J.D. 1967, American University

Seymour Herman, *Professorial Lecturer in Law*
B.S. 1948, J.D. 1952, New York University; LL.M. 1966, George Washington University

Harold Lester Hirsh, *Professorial Lecturer in Law*
M.D. 1942, Georgetown University; J.D. 1972, American University

Sheila Slocum Hollis, *Professorial Lecturer in Law*
B.S. 1971, University of Colorado; J.D. 1973, University of Denver

Bruce Richard Hopkins, *Professorial Lecturer in Law*
B.A. 1964, University of Michigan; J.D. 1967, LL.M. 1971, George Washington University

S. Neil Hosenball, *Professorial Lecturer in Law*
B.S. 1948, University of Michigan; LL.B. 1951, Harvard University

Oliver Austin Houck, *Professorial Lecturer in Law*
B.A. 1960, Harvard University; J.D. 1967, Georgetown University

Tao-tai Hsia, *Professorial Lecturer in Law*
LL.B. 1945, National Cheng-chi University, China; LL.M. 1950, J.S.D. 1952, Yale University

Nan Davis Hunter, *Assistant Professorial Lecturer in Law*
B.A. 1971, Northwestern University; J.D. 1975, Georgetown University

J. Mark Iwry, *Assistant Professorial Lecturer in Law*
B.A. 1972, M.P.P. 1976, J.D. 1976, Harvard University

Radwan Jabri, *Professorial Lecturer in Law*
LL.B. 1965, University of Aleppo; M.C.L. 1968, University of Miami; LL.M. 1970, S.J.D. 1972, George Washington University

Ira F. Jaffe, *Assistant Professorial Lecturer in Law*
B.S. 1974, Cornell University; J.D. 1977, George Washington University

Mark Rene Joelson, *Professorial Lecturer in Law*
B.A. 1955, LL.B. 1958, Harvard University

Charles Richard Johnston, Jr., *Professorial Lecturer in Law*
B.A. 1970, Ohio Wesleyan University; J.D. 1973, California Western School of Law

James Adrian Jones, *Assistant Professorial Lecturer in Law*
J.D. 1973, Baylor University; LL.M. 1978, George Washington University

Alan Hirsh Kaplan, *Professorial Lecturer in Law*
B.A. 1951, LL.M. 1957, New York University; LL.B. 1954, Harvard University

Stephen Zeivel Kaufman, *Professorial Lecturer in Law*
B.A. 1966, University of Maryland; J.D. 1969, University of Baltimore

Irving Kayton, *Professor of Law; Director of the Patent Law Program*
B.A. 1951, Cornell University; LL.B. 1957, New York University; LL.M. 1964, J.S.D. 1967, Columbia University

David Israel Kempler, *Associate Professor of Law*
B.S. 1963, University of Pennsylvania; J.D. 1966, University of Connecticut; LL.M. 1967, Georgetown University

John Alexander Kendrick, *Professorial Lecturer in Law*
B.A. 1942, LL.B. 1943, George Washington University

Peter Cornelius Kirby, *Associate Professorial Lecturer in Law*
B.A. 1971, Yale University; J.D. 1975, Harvard University

Morton Klevan, *Professorial Lecturer in Law*
B.A. 1959, Columbia University; LL.B. 1963, Harvard University

Maurice Klitzman, *Professorial Lecturer in Law*
B.S. in M.E. 1948, Purdue University; J.D. 1951, George Washington University

Henry D. Levine, *Associate Professorial Lecturer in Law*
B.A. 1972, Yale University; J.D. 1976, Harvard University

Jack Lewis, *Professioral Lecturer in Law*
B.A. 1965, Brown University; J.D. 1969, Cornell University

Patricia Gimbel Lewis, *Associate Professorial Lecturer in Law*
B.A. 1966, Wellesley College; J.D. 1971, M.B.A. 1971, Harvard University

Lela Porter Love, *Adjunct Instructor in Law*
B.A. 1974, Harvard University; M.Ed. 1975, Virginia Commonwealth University; J.D. 1979, Georgetown University

David Crittenden Lowther, *Professor of Law*
B.A. 1948, Harvard University; LL.B. 1951, University of Virginia

William Thomas Mallison, *Professor of Law; Director of the International and Comparative Law Program*
J.S.D. 1967, Yale University

Martin Guilbert Malsch, *Professorial Lecturer in Law*
B.S. 1964, College of the Holy Cross; J.D. 1968, University of Connecticut

Louis Harkey Mayo, *Professor of Law; Vice President for Policy Studies and Special Projects*
B.S. 1940, U.S. Naval Academy; LL.B. 1949, University of Virginia; J.S.D. 1953, Yale University

Robert Bruce McCaw, *Professorial Lecturer in Law*
B.S. 1965, Georgetown University; J.D. 1970, University of Virginia

Jerry J. McCoy, *Professorial Lecturer in Law*
B.S. 1963, West Virginia University; LL.B. 1966, Duke University; LL.M. 1967, New York University

James Franklin McMullin, *Professorial Lecturer in Law*
B.A. 1963, Iona College; J.D. 1966, Catholic University of America

Kenneth Everett Melson, *Associate Professorial Lecturer in Law*
B.A. 1970, Denison University; J.D. 1973, George Washington University

Leroy Sorenson Merrifield, *Lobingier Professor of Jurisprudence and Comparative Law*
B.A. 1938, LL.B. 1941, University of Minnesota; M.P.A. 1942, S.J.D. 1956, Harvard University

Frederick Leon Miller, Jr., *Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1968, Georgetown University; LL.M. 1975, George Washington University

Milton Mitchell, *Professorial Lecturer in Law*
J.D. 1942, George Washington University

Lizabeth A. Moody, *Visiting Professor of Law*
B.A. 1956, Columbia University; LL.B. 1959, Yale University

Waldo Hawthorne Moore, *Professorial Lecturer in Law*
J.D. 1949, M.P.L. 1953, George Washington University

Jerome Christian Muys, *Professorial Lecturer in Law*
B.A. 1954, Princeton University; LL.B. 1957, Stanford University

Ralph Clarke Nash, Jr., *Professor of Law; Director of the Government Contracts Program*
B.A. 1953, Princeton University; J.D. 1957, George Washington University

Stephen Michael Nassau, *Professorial Lecturer in Law*
B.A. 1961, Brown University; J.D. 1964, Columbia University

Myron H. Nordquist, *Professorial Lecturer in Law*
B.S. 1962, Oregon State University; J.D. 1969, California Western School of Law

Nicholas Stephen Nunzio, *Professorial Lecturer in Law*
B.A. in Govt. 1957, LL.B. 1960, George Washington University

Saul Chesterfield Oppenheim, *Distinguished Scholar and Adviser in the National Law Center*
B.A. 1918, M.A. 1920, Columbia University; J.D. 1926, S.J.D. 1929, University of Michigan; LL.D. 1973, George Washington University

Robert Eugene Park, *Professor of Law*
B.S. 1952, B.A. 1957, J.D. 1961, University of Florida; LL.M. 1965, Yale University

David Andreas Peterson, *Associate Professorial Lecturer in Law*
B.A. 1964, Occidental College; J.D. 1967, M.B.A. 1968, George Washington University; M.P.A. 1974, Harvard University; Ph.D. 1975, Johns Hopkins University

Arthur R. Pinto, *Visiting Associate Professor of Law*
B.A. 1969, Colgate University; J.D. 1972, New York University

Harvey Pitt, *Professorial Lecturer in Law*
B.A. 1965, City University of New York, City College; J.D. 1968, St. Johns University, New York

Maximilian Pock, *Professor of Law*
J.D. 1958, University of Iowa; S.J.D. 1962, University of Michigan

Nancy D. Polikoff, *Assistant Professorial Lecturer in Law*
B.A. 1972, University of Pennsylvania; J.D. 1975, Georgetown University; M.A. 1980, George Washington University

William Posner, *Associate Professorial Lecturer in Law*
B.S. 1961, University of Maryland; J.D. 1967, American University

Edward Andrew Potts, *Professor of Law; Associate Dean of the National Law Center*
B.A. 1949, University of Michigan; LL.B. 1952, George Washington University

Theodore L. Press, *Associate Professorial Lecturer in Law*
B.A. 1965, Cornell University; J.D. 1968, Columbia University

William C. Pryor, *Professorial Lecturer in Law*
B.A. 1954, Dartmouth College; LL.B. 1959, Georgetown University

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College; LL.B. 1949, M.A. 1957, Columbia University; Ph.D. 1966, American University

Peter Raven-Hansen, *Associate Professor of Law*
B.A. 1968, J.D. 1974, Harvard University

Arnold Winfred Reitze, Jr., *Professor of Law; Director of the Environmental Law Program*
B.A. 1960, Fairleigh Dickinson University; J.D. 1962, Rutgers—The State University (Newark)

David Robinson, Jr., *Professor of Law*
B.A. 1950, Reed College; J.D. 1956, Columbia University; LL.M. 1965, Harvard University

*Donald Phillip Rothschild, *Professor of Law*
B.A. 1950, University of Michigan; J.D. 1965, University of Toledo; LL.M. 1966, Harvard University

Meyer Rothwacks, *Professorial Lecturer in Law*
B.A. 1931, J.D. 1934, Cornell University

Joseph Michael Francis Ryan, Jr., *Professorial Lecturer in Law*
B.A. 1943, St. Joseph's College, Pennsylvania; LL.B. 1950, LL.M. 1952, Georgetown University; Associate Judge, Superior Court of the District of Columbia

Michael Sanders, *Professorial Lecturer in Law*
B.S. 1960, LL.B. 1964, New York University; LL.M. 1967, Georgetown University

Donald W. Savelson, *Professorial Lecturer in Law*
B.S. 1963, Cornell University; LL.B. 1967, Fordham University

Roger Edward Schechter, *Associate Professor of Law*
B.A. 1973, George Washington University; J.D. 1976, Harvard University

Lewis Aaron Schiller, *Professor of Law*
B.A. 1950, LL.B. 1952, University of Texas at Austin; M.A. 1958, Tufts University

Frank Schnidman, *Professorial Lecturer in Law*
B.S. 1970, Springfield College; J.D. 1973, Union University; LL.M. 1974, George Washington University

Richard L. Schwaab, *Associate Professorial Lecturer in Law*
B.S. 1967, University of Wisconsin; J.D. 1971, George Washington University

Teresa Moran Schwartz, *Professor of Law; Associate Dean of the National Law Center, for Student Relations*
B.A. 1965, Stanford University; J.D. 1971, George Washington University

Lawrence W. Secrest III, *Professorial Lecturer in Law*
B.A. 1965, American University; J.D. 1968, George Washington University

Laurence Elias Seibel, *Professorial Lecturer in Law*
B.S. 1940, City University of New York, City College; J.D. 1946, George Washington University; LL.M. 1951, Harvard University

Lester Barry Seidel, *Professorial Lecturer in Law*
B.A. 1966, University of Michigan; J.D. 1969, George Washington University; LL.M. 1970, University of Missouri—Columbia

David Earl Seidelson, *Professor of Law*
B.A. 1951, LL.B. 1956, University of Pittsburgh

David James Sharpe, *Professor of Law and of Medical and Public Affairs*
B.A. 1950, University of North Carolina at Chapel Hill; LL.B. 1955, S.J.D. 1969, Harvard University

Karin P. Sheldon, *Associate Professorial Lecturer in Law*
B.A. 1967, Vassar College; J.D. 1970, University of Washington

* On sabbatical leave, fall semester 1981.

Gene R. Shreve, *Visiting Associate Professor of Law*
B.A. 1965, University of Oklahoma; LL.B. 1968, LL.M. 1975, Harvard University

David Mark Silberman, *Associate Professorial Lecturer in Law*
B.A. 1972, Brandeis University; J.D. 1975, Harvard University

Theodore Stuart Sims, *Associate Professor of Law*
B.A. 1967, Columbia University; J.D. 1970, University of Chicago

Eric Scott Sirulnik, *Professor of Law; Director of Clinical Programs*
B.A. 1965, Franklin and Marshall College; J.D. 1968, Boston University; LL.M. 1970, George Washington University

Dudley Graham Skinker, *Clerk of the Trial Practice Court*
LL.B. 1940, George Washington University

Lewis David Solomon, *Professor of Law*
B.A. 1963, Cornell University; J.D. 1966, Yale University

Theodore Irwin Sonde, *Professorial Lecturer in Law*
B.A. 1961, City University of New York, City College; LL.B. 1964, New York University; LL.M. 1967, Georgetown University

*James Edward Starrs, *Professor of Law and of Forensic Sciences*
B.A., LL.B. 1958, St. John's University, New York; LL.M. 1959, New York University

Charles J. Steele, *Professorial Lecturer in Law*
B.A. 1952, J.D. 1954, LL.M. 1957, Georgetown University

Alexander Louis Stevas, *Professorial Lecturer in Law*
B.A. 1949, LL.B. 1951, George Washington University

†Russell Bennett Stevenson, Jr., *Professor of Law*
B.M.E. 1964, Cornell University; J.D. 1969, Harvard University

Joan H. Strand, *Adjunct Instructor in Law*
B.A. 1972, J.D. 1975, George Washington University

Jerome Kenneth Tankel, *Professorial Lecturer in Law*
B.A. 1957, University of Illinois; J.D. 1963, Harvard University; LL.M. 1968, George Washington University

Morton S. Taubman, *Professorial Lecturer in Law*
B.S. 1965, J.D. 1969, University of Baltimore

Richard E. Timbie, *Professorial Lecturer in Law*
B.S. 1968, J.D. 1971, Stanford University

Robert Max Tobias, *Professorial Lecturer in Law*
B.A. 1965, M.B.A. 1967, University of Michigan; J.D. 1969, George Washington University

Stefan Franklin Tucker, *Professorial Lecturer in Law*
B.B.A. 1960, J.D. 1963, University of Michigan

Geoffrey Judd Vitt, *Associate Professorial Lecturer in Law*
B.A. 1969, J.D. 1972, George Washington University

Maryann Walsh, *Assistant Professorial Lecturer in Law*
B.A. 1970, Trinity College (District of Columbia); J.D. 1974, University of Denver

David Benson Weaver, *Professor of Law*
B.A. 1943, Ohio Wesleyan University; J.D. 1948, Case Western Reserve University

Frederick Weisberg, *Professorial Lecturer in Law*
B.A. 1965, Cornell University; J.D. 1968, University of Michigan

Glen Earl Weston, *Oppenheim Professor of Antitrust and Trade Regulation Law*
B.S. 1943, University of Maryland; J.D. 1948, George Washington University

John Leslie White, *Professorial Lecturer in Law*
B.A. 1948, M.S. 1949, Kalamazoo College; J.D. 1958, George Washington University

Richard Carlton Wills, *Adjunct Instructor in Law*
B.S. 1972, J.D. 1975, Villanova University

---

*On sabbatical leave, fall semester 1981.
† On leave of absence, academic year 1981-82.

Guy Kent Woodman, *Associate Professorial Lecturer in Law*
B.A. 1971, Oklahoma State University; J.D. 1974, Vanderbilt University

Elyce Zenoff, *Professor of Law*
B.S. 1951, University of Wisconsin; LL.B. 1954, Northwestern University

Luize Elizabeth Zubrow, *Associate Professor of Law*
B.A. 1969, J.D. 1972, University of Colorado

SUMMARY OF REGISTRATION, FALL SEMESTER 1980

	1st year	*2nd year*	*3rd year*	*4th year*	*Graduate*	*Other*
Day	338	376	359	.....	76	.....
Evening	117	82	68	81	147	36

Total: 1,680

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COLLEGES AND SCHOOLS—DEGREE PROGRAMS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart. Sc.), and Bachelor of Science in Geodesy (B.S. in Geod.)

GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

SCHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

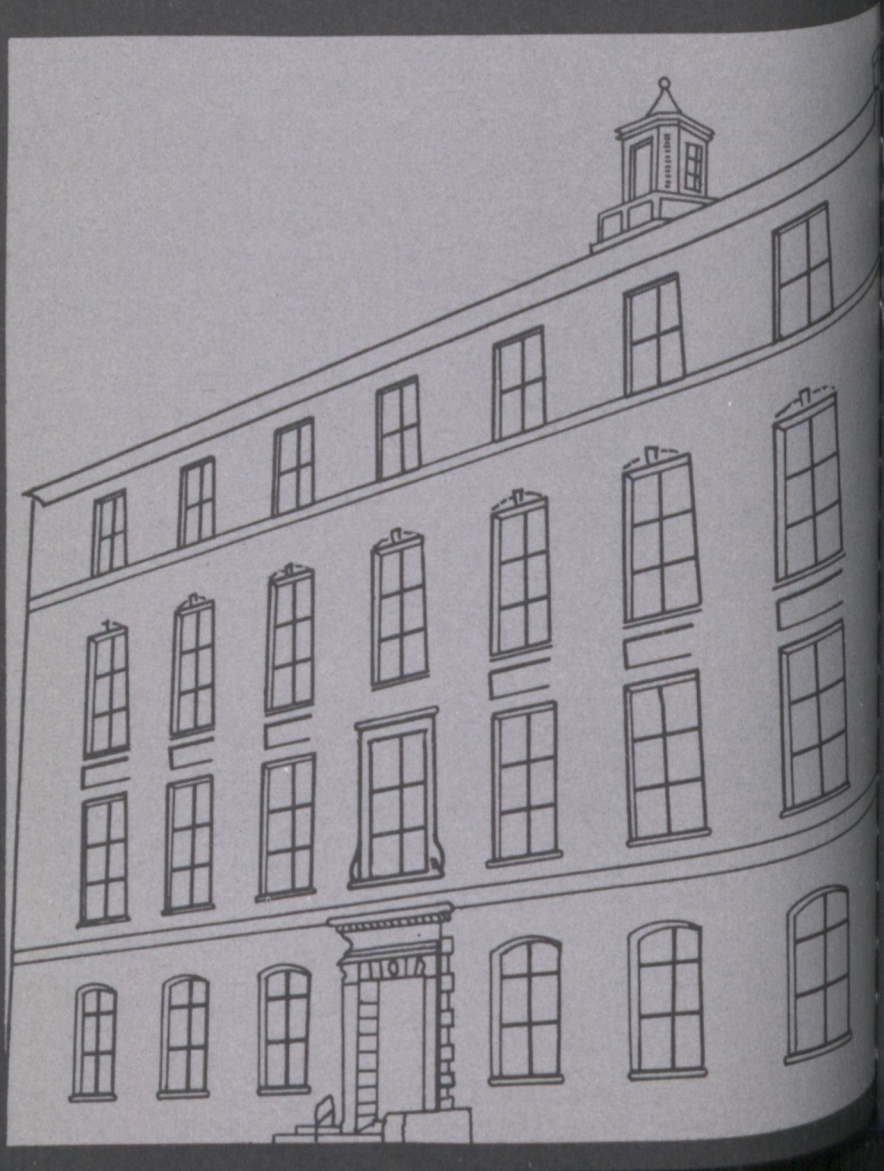
NATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

SCHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil Engineering) (B.S. [C.E.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]), Bachelor of Science (Operations Research and Computational Science) (B.S. [O.R.& C.S.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Doctor of Science (D.Sc.), Engineer (Engr.), and Applied Scientist (App.Sc.)

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT: Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business Administration (B.B.A.), Master of Accounting (M.Acct.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Urban and Regional Planning (M.U.&R.P.), Post-Master's Graduate Certificate in Health Services Administration (Grad.Cert.in H.S.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.) and Master of Arts (M.A.)



E GEORGE WASHINGTON UNIVERSITY BULLETIN
me LXXX, No. 2, April 1981

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-1982

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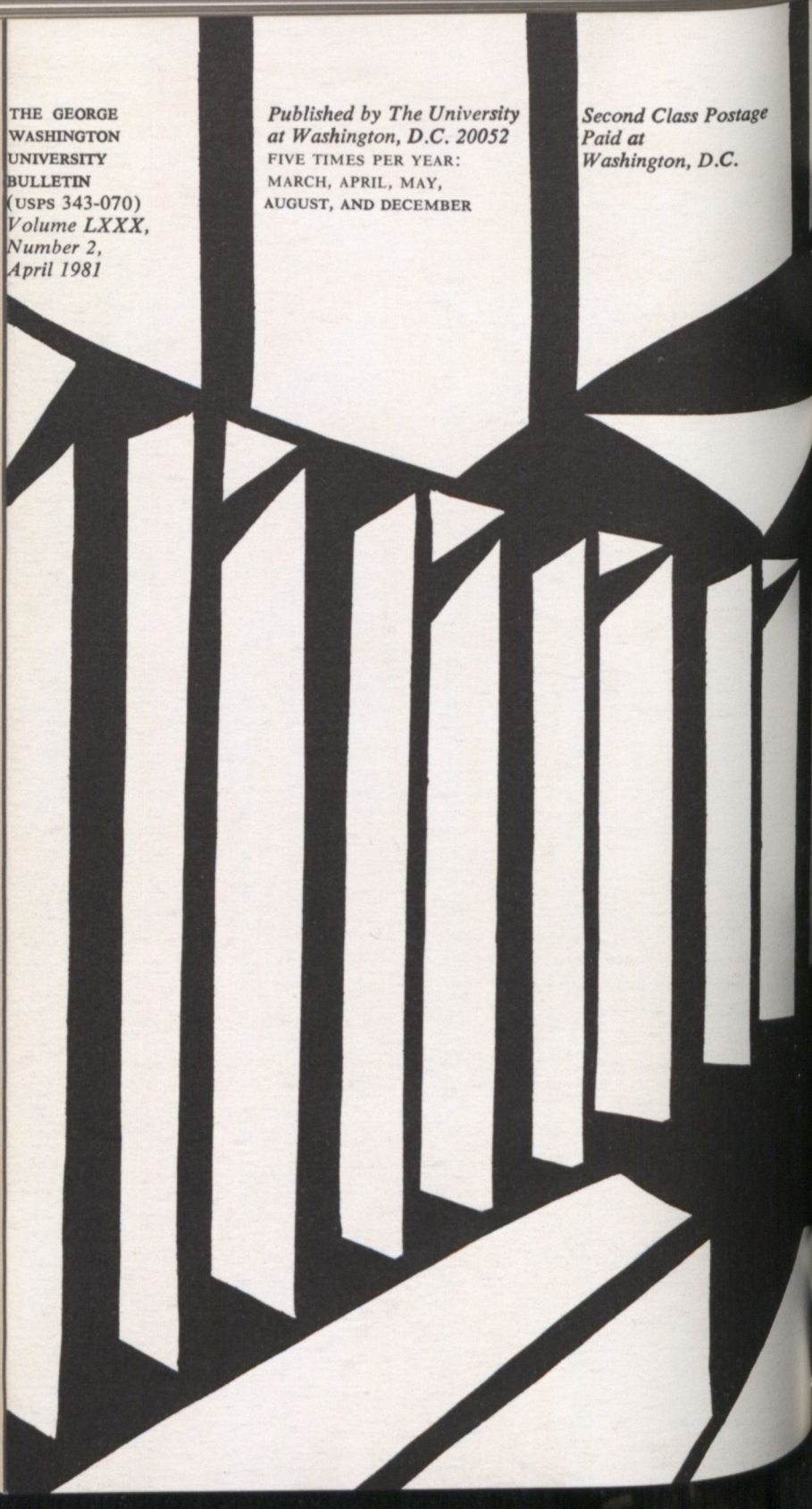

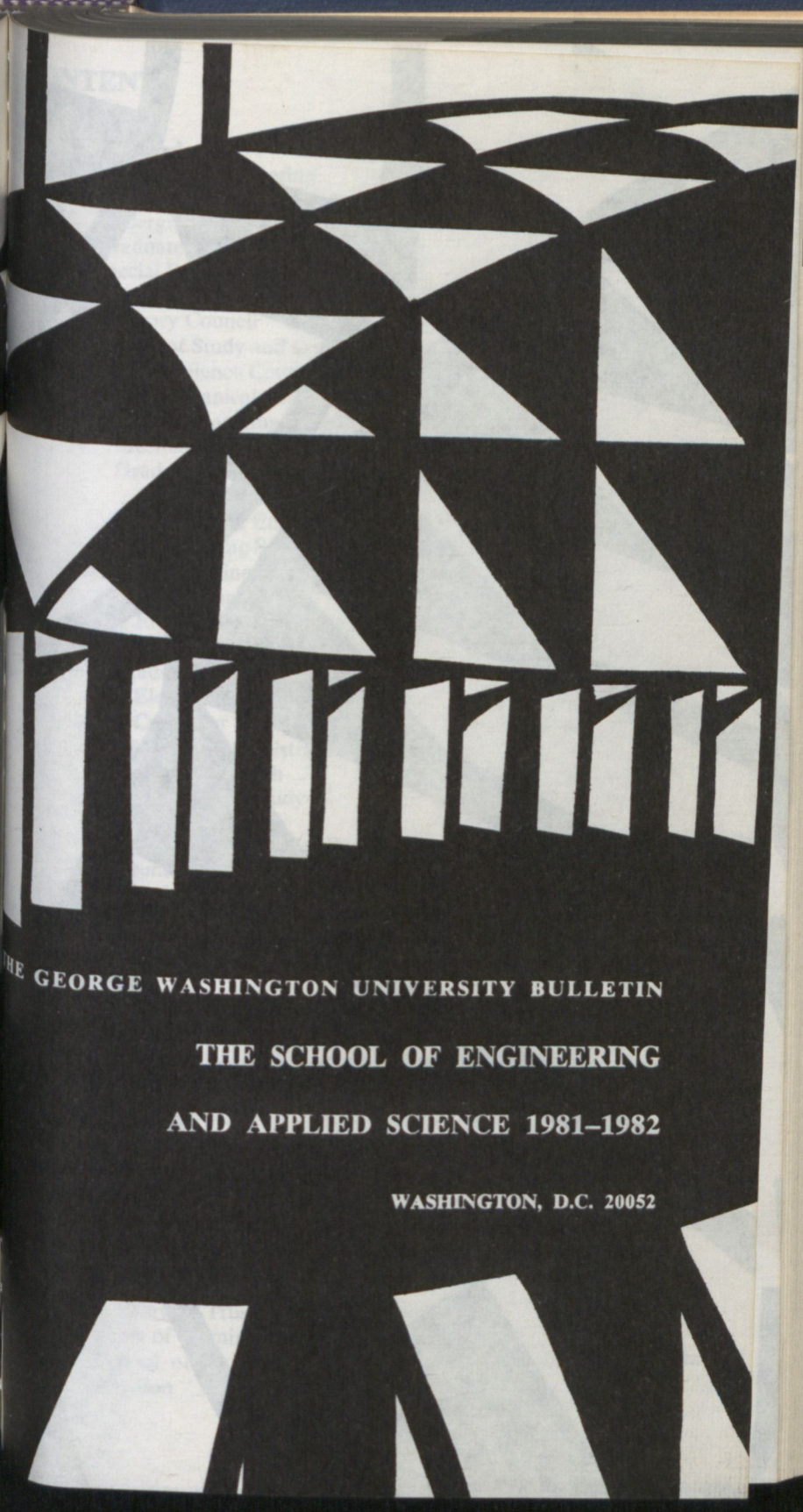

THE GEORGE WASHINGTON UNIVERSITY BULLETIN

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE 1981–1982

WASHINGTON, D.C. 20052

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THE CALENDAR 1981–1982*

1981 FALL SEMESTER

September 1–2	Advising for all students *Tuesday-Wednesday*
September 2	Orientation for new students from foreign countries *Wednesday*
September 3	Orientation and placement tests for all new undergraduate students *Thursday*
†September 3-5	Registration—Tompkins Hall of Engineering *Thursday-Saturday*
	Application for February graduation due as part of registration
September 7	Labor Day (holiday) *Monday*
September 8	Classes begin *Tuesday*
November 2	Application for spring semester financial aid due *Monday*
November 23	D.Sc. dissertations of February candidates due *Monday*
November 25	Thanksgiving recess begins after last class *Wednesday*
November 30	Classes resume *Monday*
December 8	Last day of fall semester classes *Tuesday*
December 14–23	Examination period *Monday–Wednesday*

1982 SPRING SEMESTER

January 8	Master's theses of February candidates due *Friday*
January 11	Orientation for new students from foreign countries *Monday*
January 12–13	Orientation and placement tests for all new undergraduate students *Tuesday-Wednesday*
	Advising for all students
†January 14–16	Registration—Tompkins Hall of Engineering *Thursday-Saturday*
	Application for May graduation due as part of registration
January 18	Spring semester classes begin *Monday*
February 8	Deadline for submission of 1982–83 freshman student financial aid applications *Monday*
February 22	Winter Convocation (holiday) *Monday*
March 8	Deadline for submission of 1982–83 continuing and transfer undergraduate student financial aid applications; D.Sc. dissertations of May candidates due *Monday*
March 13	Spring recess begins after last class *Saturday*
March 22	Classes resume *Monday*
April 1	Deadline for submission of Summer Sessions and 1982–83 graduate financial aid applications *Thursday*
April 19	Master's theses of May candidates due *Monday*
April 23	Last day of spring semester classes *Friday*
April 29–May 8	Examination period *Thursday–Saturday*
May 9	Commencement *Sunday*

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* This calendar is subject to change.

† The registration procedure and hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

1981

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TO ALL PROSPECTIVE STUDENTS:

The School of Engineering and Applied Science has been in continuous session since 1884, and offers programs of study leading to Bachelor's, Master's, Professional, and Doctor's degrees. Its prime objective is to develop in the student the precious asset of a well-trained mind which may be applied to the attainment of our many national objectives. In these changing times, it is necessary to search for quality. Students and faculty have the opportunity of assisting in the planning and implementation of educational programs. Examination is made periodically of the School's objectives and how they relate to those established by the Engineering Council for Professional Development (ECPD). Emphasis includes such items as the student's basic and advanced levels of education and role in present and future society.

This catalogue describes the programs and requirements for undergraduate and graduate study in the School of Engineering and Applied Science and includes information on the Engineering Honors Scholarships, Cooperative Education Program in Engineering, and the Joint Institute for Advancement of Flight Sciences (JIAFS).

The program of Engineering Honors Scholarships has been established to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of academic merit only and financial need is not a requirement for consideration.

The Cooperative Education Program in Engineering provides the undergraduate engineering student with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with practical, first-hand experience in the student's chosen field of engineering. The student's earnings will help to pay for a major part of the cost of an engineering education.

JIAFS was created by the joint efforts of the NASA-Langley Research Center and the School of Engineering and Applied Science. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA-Langley Research Center to prepare qualified graduate students for careers in research, development, design, and teaching.

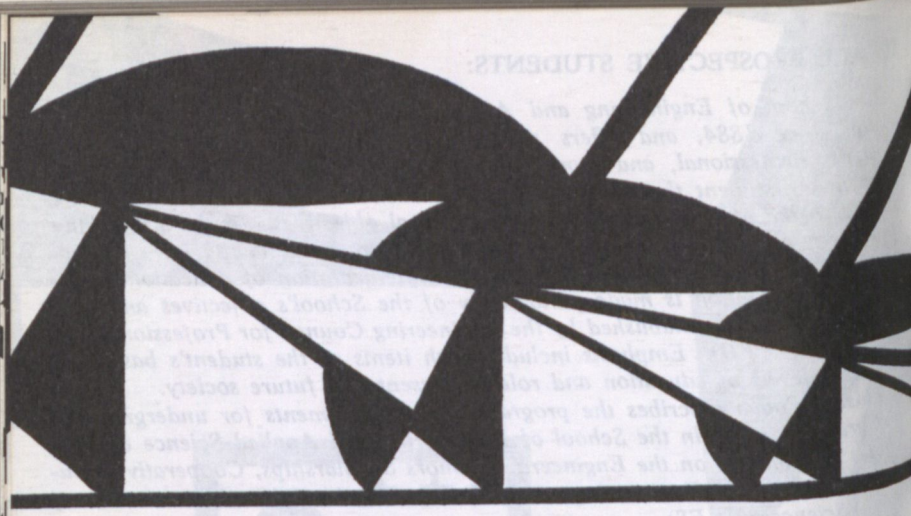
The School of Engineering and Applied Science is a professional school in a university comprised of eight degree-granting schools and colleges. The environment of the nation's capital is very favorable for the intellectual and cultural development of the student. The metropolitan Washington area contains the second largest concentration of research and development in the United States, and the engineering component of this activity is similarly extensive, offering many employment opportunities to students after graduation.

The atmosphere of the School is one of serious-minded effort toward mature development. Being a small school, it recognizes the individual as the single most important element in the educational process. The student body, undergraduate and graduate, has a primary interest in design, research, development, and management in both scientific and engineering activities. Many alumni of the School are successfully engaged in all fields of engineering—in science, management, government, and education.

The philosophy of the School, which might be summarized as "education for creativity, not conformity," has through the years reflected the many subtle and profound changes in the engineering profession.

The faculty of the School and I look forward to a closer and more fruitful relationship with you. If you need additional information, please do not hesitate to call upon the department chairmen or me.

HAROLD LIEBOWITZ
Dean



THE STUDY OF ENGINEERING

The Meaning of Engineering and Applied Science

The responsibilities and activities of the engineering profession extend into every aspect of industry and research and into many fields of commerce and the arts. Engineers face problems in the production and distribution of all types of manufactured products, including the design of mechanical, electrical, and chemical processes, of equipment, and of plants in which such products are made; in the design and construction of a variety of structures such as bridges, tunnels, harbors, and dams; in aircraft design and construction, including complicated electronic equipment for control, guidance, and communication; in the operation of transportation systems; in the automotive industry; in the missile and space programs; in energy resources and power and in the generation and transmission of power; in modern communication; in traffic control; in city planning; in public health and sanitation as it affects the environment; and in ventilation and refrigeration. This list of applications is far from exhaustive; it does indicate, however, that engineering is a broad profession in which there are many opportunities to specialize.

The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important to emphasize the distinction between engineering and science. The President's Scientific Advisory Committee points out that the engineer and scientist each play an important role on a team: "The scientist is one who seeks to extend the boundaries of knowledge in his chosen field. The engineer has the task of combining the knowledge of science with a knowledge and awareness of the needs and limitations of human beings and of a human society to develop and create things for human use. . . . While scientists have uncovered the basic knowledge, it is the engineers who have created the tangible tools, materials, and products that have revolutionized our daily lives, our community living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge as a service to society, financial considerations, human resources, and society's needs are interrelated. The engineer is concerned, therefore, with the means for operating a dynamic society, and must consider not only whether the knowledge that exists will enable the creation of a workable product, but also how the product can be built, who will use it, and how such use will affect the environment in which it will operate.

The Professional Engineer

Engineers are concerned with the quality and preservation of human life. Engineer, as the term is used in this Bulletin and as it is commonly understood in our society, refers to the person who makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of purpose in serving as an intellectual agent in the practical world. This responsibility of the engineer arises from the breadth of the implications of engineering for the whole of society as well as from the depth of the requirements for competence. Technology has radically rearranged human life in our time. There are many who believe that, although the threshold of space has been crossed, the union of medical and engineering practice has been achieved, and breakthroughs have been made in other areas, this impact of engineering on modern life is just a modest preview of the engineering of tomorrow.

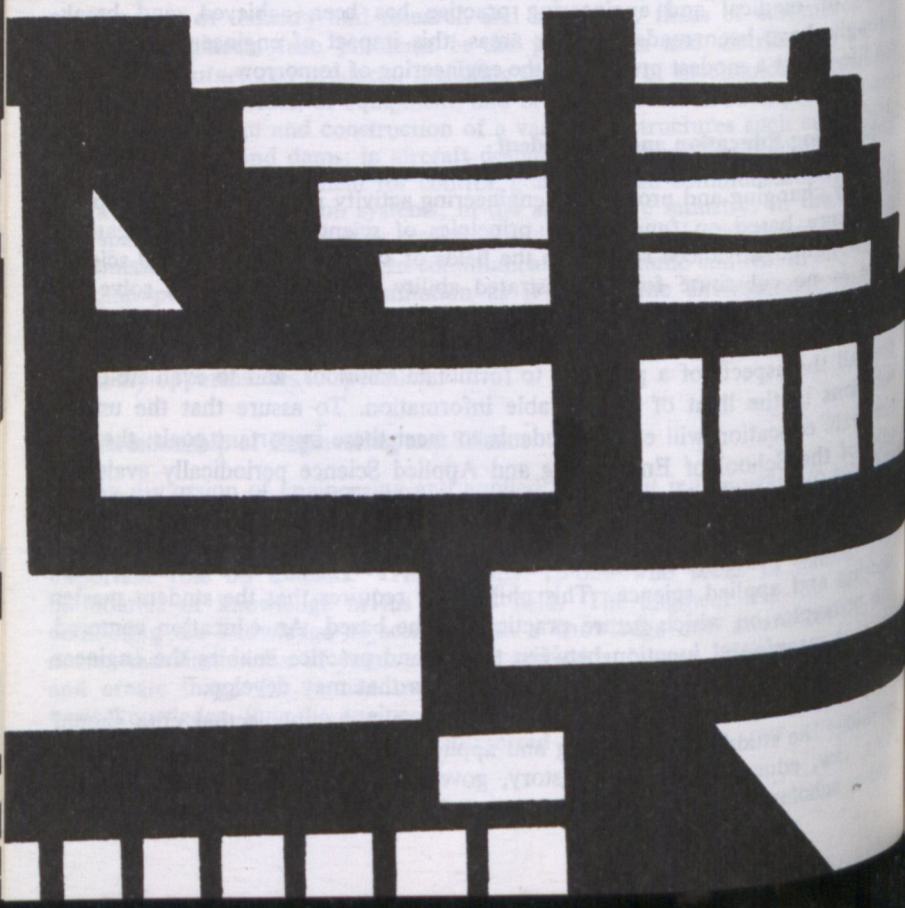
Engineering Education and the Student

Rapidly changing and progressing engineering activity requires an education for the future based on fundamental principles of science useful in applications to a dynamic, advanced society. In the fields of engineering and applied science there is no substitute for demonstrated ability and competence to solve the problems faced. Without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze and interpret all the aspects of a problem, to formulate solutions, and to evaluate those solutions in the light of all available information. To assure that the undergraduate education will enable students to meet these important goals, the faculty of the School of Engineering and Applied Science periodically evaluates and appraises the undergraduate program.

The curricula of the School of Engineering and Applied Science are founded on the basic principle of assisting the student in preparing for a career in engineering and applied science. This philosophy requires that the student master the principles on which future practice will be based. An education centered on that meaningful junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, science, history, government, and other disciplines, requires scholars. But in any of these areas the prospective student who has not

achieved high scholastic standing can find a place, if the student has genuine interest in the subject. The average student who is interested and willing to work will find in engineering and applied science a rich and varied field of study which can lead to satisfaction and success. It is difficult to make generalizations in this area, but students who have demonstrated an aptitude for mathematics, science, and English will probably find the work of engineers and the study of engineering and applied science satisfying and challenging. Innate intellectual curiosity and the desire to learn and to work hard are good indicators of success. College Board examinations may reveal the capacity to undertake further study in mathematics and science and their applications to engineering. No school or college can "give" an education. It can offer only the opportunity to "get" an education. The George Washington University's School of Engineering and Applied Science is a small school which provides an opportunity for close contact with faculty members, as well as the opportunity to participate in student organizations, and in many other student activities. The School recognizes the individual as the most important element in the educational process.



THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

History

The School of Engineering and Applied Science was organized October 1, 1884, as the Corcoran Scientific School of Columbian University and was situated in the University Building then at 15th and H Streets, N.W. The School was named in honor of William W. Corcoran, Trustee and President of the Corporation from 1869 to 1888. Day and evening courses were offered in literature, science, and technology and led to the degrees of Bachelor of Science, Civil Engineer, Mechanical Engineer, and Mining Engineer. The School was among the first to accept women for degree candidacy in engineering.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and the Columbian College were merged into a single Department of Arts and Sciences. Graduate engineering degrees were offered.

Administrative changes led to The Washington College of Engineering being initiated in 1905 as one of the several semi-independent undergraduate colleges of the University, each with its own Board of Trustees. The College provided instruction leading to undergraduate degrees in engineering and architecture.

In 1909 the name of the College was changed to the College of Engineering and Mechanic Arts, and the curricula were revised to give the student a thorough understanding of the theory underlying engineering practice. Emphasis was placed on the development of a knowledge of scientific principles upon which the student could build and by which he might solve new problems as they are met in practice.

The name of the School was changed again in 1914 to the College of Engineering and later to the School of Engineering. Architecture was dropped from the curriculum, and degrees were limited to the field of engineering. However, the primary emphasis upon principles rather than technology which had characterized the School since 1903 was continued and has remained to this day as one of the important distinguishing features of the School.

In 1962 the name of the School became the School of Engineering and Applied Science.

Academic Status

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The undergraduate curricula in Civil Engineering, Electrical Engineering, and Mechanical Engineering are accredited by the Accreditation Board for Engineering and Technology (formerly the Engineers' Council for Professional Development).

University Policy on Equal Opportunity

George Washington University does not discriminate against any person on the basis of race, color, religion, sex, national origin, age, handicap, or veteran status. This policy covers all programs, services, policies, and procedures of the University, including admission to educational programs and employment. The University is subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Dr. Marianne Phelps, Assistant Provost for Affirmative Action, George Washington University, Rice Hall, Washington, D.C. 20052, or to the Assistant Secretary for Civil Rights of the Department of Education.

Undergraduate Study

The undergraduate program is intended to provide a solid foundation in the basic principles, concepts, and techniques underlying engineering and applied science, on which the individual may build technical competence in a variety of areas as his professional career develops. It is preparation for a career in engineering or applied science, as it exists today and as it may develop in the future.

Undergraduate study is the formal beginning of a lifelong continuing program of education. The School provides an environment that fosters the attitudes and disciplines essential to professional growth. Graduates, when they receive the bachelor's degree, are prepared for productive work in the chosen field and for further development and progress, both formal and informal. The undergraduate curricula include courses in the humanities and social sciences to the extent necessary to develop a reasonable understanding and appreciation of these areas of knowledge.

Admission to the engineering program indicates that the student possesses at least minimum preparation and the probable capacity to meet the academic demands of this School. Since the School cannot predict either the student's response to the academic demands or the program to follow for the most effective development, the undergraduate program has been designed to offer a variety of experiences through which the student may find the best path to educational growth and maturity.

The School is a place for learning; for experiencing adventures of the mind and of the hands; for the formulation, exchange, and exploration of ideas. During the undergraduate years the student is led to strengthen skills in analysis and talent for creative activity, through liberal use of project-type laboratory work. Independent thought and original ideas receive higher evaluation, in the appraisal of student achievements, than the rote recital of information.

To provide the undergraduate engineering student with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with relevant, real-world employment which provides practical, first-hand experience in engineering, the School of Engineering and Applied Science has a Cooperative Education Program in Engineering in which arrangements have been made with leading industrial and governmental organizations for student employment at prevailing salary rates. Every effort is made to place the student in positions of employment that provide the best possible engineering experience consistent with career plans. These work periods provide the student with income that may be used to finance the major portion of tuition and other expenses. Entering freshmen, as well as transfer students from community colleges whose completed work is equivalent to requirements in this program, can be admitted to the Cooperative Education Program in Engineering.

ADMISSION TO UNDERGRADUATE STUDY

The School admits those applicants who can benefit themselves and society by disciplined intellectual effort in its environment.

Admission is the first selective step in a long series of qualifying steps the student will take in his progress toward professional competence in engineering. It indicates the School's belief that the applicant has at least the minimum preparation and ability to complete the curriculum successfully.

The applicant must be of good character and must have an academic background appropriate for the program of studies contemplated.

Application for Admission

An applicant for admission obtains from the Office of Admissions of the University or from the School of Engineering and Applied Science an application blank which must be filled out completely and returned with the $15* application fee.

Students From U.S. Institutions

Records presented become the property of the University and *cannot* be returned.

* Application fee must be by check or postal money order, payable to George Washington University. The application fee is waived for a student applying for readmission who was registered in a degree program at the time of the student's last registration at this University and who has not since registered at another institution.

INCOMING FRESHMEN

Consideration for admission is based on the following: (1) an acceptable certificate of graduation from an accredited high school showing at least 15 units*; (2) scores on the College Entrance Examination Board's Scholastic Aptitude Test (SAT), or on the American College Test (ACT).

The principal's statement that the applicant is prepared to undertake college work may also be requested by the University.

Nine and one-half of the 15 units required for entrance must be distributed as follows: three in English, two in algebra, one in plane geometry, one-half in plane trigonometry, one in physics or chemistry, and two in history or one foreign language. General science may *not* be counted in satisfaction of the science requirement but may be counted as an elective unit. It is recommended that *both* physics and chemistry be studied in high school.

The qualifications of applicants who, because of unusual circumstances, do not meet the above requirements will be considered by the School, which may prescribe admission tests.

An applicant must arrange to have sent directly *from his school to the Office of Admissions of the University* the secondary school academic record. This information must be stated on a standard form used by the secondary school, and all essential information must be included.

Quantitative Deficiency—A graduate of an approved high school who lacks not more than two units of the required subjects and who presents 15 acceptable units may be admitted to a prescribed program which includes courses to make up the deficiencies.

Applicants who wish to begin study in the fall semester should formulate plans early in the high school senior year. Although the University prefers to have applications submitted during the fall semester of the high school senior year, applications may be submitted until August 1. However, students wishing to be considered for financial aid or on-campus housing should have their applications and all required documents submitted by February 8. Students graduating at mid-term wishing to begin study in the spring semester *should* have their applications, transcripts, and other required documents submitted no later than December 15. Applications and all required credentials of students wishing to begin study in either the first or second term of the summer session must be received prior to April 15. Applications for the third summer session should be received by July 1.

Although decisions on some applications for the fall semester will require submission of seventh-term grades and senior-year test scores, an earlier decision will be given after September 1 to a student whose application becomes complete with a secondary school record through the junior year and junior-year test scores, provided these records clearly establish admissibility.

TRANSFER STUDENTS

Transfer students from other institutions (see page 24 for minimum residence requirement) should submit all applications and required credentials prior to

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* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods of prepared classroom work.

August 1 for the fall semester, December 1 for the spring semester, April 1 for the summer sessions.

The transfer student must be in good standing as to scholarship and conduct. A student who has been suspended more than one time, has been academically dismissed, or is currently on probation from another academic institution will not normally be considered for admission.

An applicant who has attended one or more institutions of higher learning must request *each registrar* to mail directly *to the Office of Admissions of the University* a transcript of his or her record, *even if credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (*C* or better in academic courses from an accredited institution), at the time the application is submitted, the applicant must request that the high school record and College Examination Board SAT or ACT test scores be sent to the Office of Admissions.

Students from Foreign Institutions

The application, required records, and scores on the Test of English as a Foreign Language (TOEFL) (see below) or American Language Institute Georgetown University test (ALIGU) must be received from *all international applicants* whose schooling was not in English no later than June 1 for the fall semester, November 15 for the spring semester, and April 15 for the summer sessions.

REQUIRED RECORDS

At the time the application is sent, the applicant must request the educational institution previously attended to send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation completed by an independent agency.

Consideration will be given to academic documents delivered by the student if circumstances prohibit the receipt of official records.

LANGUAGE TEST

Students whose native tongue is not English are required to take the TOEFL test (Test of English as a Foreign Language) or the ALIGU test (American Language Institute, Georgetown University). Students are responsible for making arrangements for taking these tests. Foreign students abroad should consult with the nearest U.S. Embassy for information on arrangements for taking ALIGU. Those interested in TOEFL should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08540, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score

sent to three different institutions. Registration for either the TOEFL or the ALIGU test does not constitute application for admission to George Washington University.

The TOEFL *Bulletin of Information*, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test, lists of examination centers, examination dates, and an application blank. On the application for the Test, the student should specify that the scores be sent to the appropriate admissions office at this University (see "Admission to Undergraduate Study," pages 13–15, or "Graduate Admission Procedure," page 28).

In addition to the TOEFL or ALIGU tests, an admitted student may be required to take a test in English as a Second Language prior to registration. Results of this test will determine the courses the student will be permitted to register for in the program of study. If the knowledge of English is inadequate to enable the student to undertake any academic work, the student will not be permitted to register for any courses other than English and will be required to study English on a full-time basis. Students in this category should therefore expect to take a longer period of time to complete their graduation requirements than students who are not obliged to complete the additional English courses.

International students in the United States may take a locally administered George Washington University English placement test in lieu of the ALIGU or TOEFL test. A $10 fee is charged for this examination. Because this test is not given on a regularly scheduled basis, arrangements may be made by contacting:

Dr. George R. Bozzini, Director
English for International Students
George Washington University
Washington, D.C. 20052
(202) 676-7136

FINANCIAL CERTIFICATE

If a student plans to enter or remain in the United States to study at this University and the visa status will be either student (F) or exchange visitor (J), a Form I-20 or DSP-66 cannot be issued until the student has been admitted to the University and has completed the Financial Certificate satisfactorily. The Financial Certificate is a document which may be obtained from the School of Engineering and Applied Science. It requests information about the resources (money) available to the student to support his/her educational and living expenses while in the United States. The Certificate should be accompanied by supporting documents such as bank statements or letters from governments authorizing scholarship awards.

SPECIAL ENGLISH COURSES FOR INTERNATIONAL STUDENTS

The extensive experience of the Department of English with the language needs of international students has been synthesized into a comprehensive English Language Program that includes the following courses:

ENGLISH AS A FOREIGN LANGUAGE

20 Intensive Basic English (0)

Meets 20 hours per week. The objectives of the course are to strengthen the ability to use basic grammatical structures appropriately and to introduce increasingly complex structures; to build reading skills and to enlarge vocabulary through the use of specially adapted materials; to introduce the student to unadapted reading materials, such as newspapers; to focus on writing sentences; to familiarize the student with the cultures of the English-speaking peoples; and to foster multicultural sharing among international students. No academic credit. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

30 Intensive Lower-Intermediate English (0)

Meets 20 hours per week. The objectives of the course are to increase the ability to use complex grammatical structures; to develop writing ability through the paragraph level and to improve reading skills; to enlarge vocabulary further and to encourage oral expression through practical conversation and laboratory exercises. No academic credit. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

40 Intensive Higher-Intermediate English (0)

Meets 20 hours per week. The objectives of the course are to provide a comprehensive review of grammatical structure, including clauses; to expand vocabulary further through use of unadapted reading material; to increase reading speed and comprehension; to encourage oral expression of ideas encountered in the student's reading material. The course also includes instruction in composition which focuses on outlining and techniques of exposition. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

45 Semi-Intensive Higher-Intermediate English (0)

Meets 10 hours per week. The objectives of the course are the same as for EFL 40. Students enrolled in EFL 45 may—with the authorization of the Admissions office of the school to which they are applying—take one undergraduate or graduate course concurrently with English. Tuition is charged at the rate of 5 semester hours.

50 Advanced English (3)

Meets 4 hours per week. An advanced-level composition course for students showing a high degree of academic proficiency in English. The aim of the course is to develop writing skills and to foster an understanding of technical writing. The course requires a writing assignment each week and a 10–20-page research paper. For the latter project, the student is introduced to library research methods. The course meets 4 class hours per week and also involves extensive individual counseling outside the classroom. Laboratory fee, $25.00.

The language laboratory is available to all students in the English Language Program. The laboratory contains a library of tapes that accompany the printed texts and a variety of listening and recording equipment, including individual recording and playback equipment.

Admission to a particular English class is determined by a suitable series of objective and nonobjective tests.

The English Language Program is administered by the College of General Studies and is offered in cooperation with the Department of English, Professor J.P. Reesing, Jr., Chairman. The English for International Students Program is under the direction of Dr. George R. Bozzini.

PROVISIONAL REGISTRATION OF INTERNATIONAL STUDENTS

Outstanding international students who do not meet the minimum test scores for the TOEFL or ALIGU may be admitted to the School on a "provisional" basis. This "provisional" admission requires the student to take an "English only" program until an improved English capability permits the student to take technical courses. After satisfactory completion of English language requirements, such students will be granted full admission status.

READMISSION

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer session excluded) must apply for readmission. Final dates for applying are the same as those for undergraduate admission (see pages 14–15), or graduate admission (see page 28). If the student applies as a degree candidate and was previously registered as a nondegree student, or if a student has attended one or more higher institutions while absent from the University, the student must have complete, official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for a student applying for readmission who was a degree candidate at the time the student last registered at this University and who has not since registered at another institution.

Advanced Standing

CREDIT BY EXAMINATION

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned toward partial fulfillment of the engineering curriculum upon admission to the University for each or any combination of the following:

College Entrance Examination Board Advanced Placement Tests (APT)—Credit is assigned for examinations passed with scores of 4 or 5 on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. Examinations passed with scores of 3 will be considered for credit or placement if the student arranges to have the examina-

tion paper sent to the Office of Admissions. The Advanced Placement Tests are administered in the secondary school in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 1025, Berkeley, Calif. 94701.

College Entrance Examination Board College-Level Examination Program (CLEP)—CLEP offers two types of examinations: general and subject. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in more than 47 subjects.

New Students—Upon admission to degree candidacy in the School of Engineering and Applied Science, students may be assigned undergraduate credit for the General Examinations in the social sciences (six credit hours) and humanities (six credit hours) passed at the 50th percentile or above (college sophomore norms); such credit is assigned in partial fulfillment of the 18 credit hours required in the humanities and social sciences. Credit is not assigned against the engineering curriculum for CLEP General Examinations passed in the areas of mathematics, natural sciences, or English composition.

Credit is assigned for the CLEP Subject Examinations which are applicable to the School's curricula and which are passed at the level recommended in the College Board model policy.

Registered Students—A candidate for a degree (*i.e.*, a student already registered at the University before taking the CLEP Examinations) must seek departmental approval prior to taking the CLEP Examination for credit. Credit may not be earned by passing the Examination after having taken the equivalent course or after having taken a waiver examination for the course.

Arrangements for the Examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 1824, Princeton, New Jersey 08540.

Department Examinations for Waiver or Credit—Registered SEAS students may also take examinations in some departments for waiver of, or credit for, a specific course (see Fees, p. 215) upon approval of the appropriate department chairman; before the test is administered, the student must have demonstrated sufficient preparation to warrant being given the test. An examination for credit is not allowed if an examination for waiver has been successfully completed or if the student has taken the course.

MAKEUP OF CREDIT FOR WAIVED COURSES

If a mathematics or natural science course required by the engineering curriculum is waived, the corresponding credit hours must be earned by satisfactory completion of a university-level course, either technical or non-technical, which is approved by the student's faculty adviser or Department Chairman.

WAIVER OF THE ENGLISH COURSE REQUIREMENT

A waiver of the English course requirement in the core curriculum will be granted to those who achieve a score of 650 or higher on the English Composition Achievement Test of the College Entrance Examination Board.

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work or examination, advanced standing may be granted for work successfully completed at accredited institutions of higher learning. Credit will be granted only when such work meets the requirements for the degree sought at this University. Work of low caliber (*D* or the equivalent) will not be considered for transfer.

Although there is no strict limit to the total amount of transfer credit that may be assigned, a student must satisfy the residence and course requirements for the degree sought at George Washington University.

CREDIT FROM SERVICE SCHOOLS

A limited amount of credit may be assigned for selected service school instruction received since 1941. No more than 30 semester hours may be assigned for a combination of service schools and examinations referred to above. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

CREDIT FROM BALTIMORE POLYTECHNIC INSTITUTE

Credit will be assigned to Baltimore Polytechnic Institute "A" course graduates who have earned scores of 80 or above in the applicable courses equivalent to the following engineering core curriculum courses: Math 31, 32; Phys 3, 15; Chem 13; Eng 4; EE 51.

REGULATIONS

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 213-18; other University regulations, on pages 224-28.*

Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. Students may attend only those classes for which they are registered. Regular attendance is required. Students may be dropped from any course for undue absence.

Students are expected to attend every meeting of the courses in which they are registered, fully prepared to carry on the work required. Students are held responsible for all work in their courses, including work missed because of absence. Excuses for absences from examinations which have been announced

in advance can be obtained only by written application to the instructor in charge of the course.

Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 20 semester hours. A student employed more than 24 hours a week who is not on probation may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the Dean's permission. Students on probation may not register for more than 12 semester hours during the period of their probation.

Advisory System

The School of Engineering and Applied Science encourages a close faculty-student relationship. Every entering undergraduate student is assigned a permanent faculty adviser to assist in orientation in the professional discipline. Faculty advisers counsel students on their programs of study, the achievement and maintenance of satisfactory scholastic performances, professional development, and extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration for each academic semester and summer session. Until the work required for the degree is completed, students must consult with their adviser in all academic matters. However, an adviser may not deny entry into any course or activity to which the student is entitled under the regulations of the School.

All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the Dean, Associate Dean, Department Chairman, and adviser concerning any student problems.

Faculty advisers counsel students to the best of the advisers' professional knowledge, but the final reponsibility for a student's action lies with the student.

Scholarship

For scholarship requirements for graduation, see "Graduation Requirements," pages 23–24.

Grades—Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal, or Failure to Take the Final Examination. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his control, is unable to complete the work of the course, and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior per-

formance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change. Although the grade of *I may* remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. A grade of *I* that is not removed after one calendar year will be changed on the permanent record to a grade of *F*. A course in which a student receives an *F* in this way must normally be repeated. The grade to which the *I* is changed will be applied to the grade report for the semester or summer session during which the change is made for the purposes of determining probation, suspension, quality-point index, and so forth.

Note: Grades discussed in the paragraphs above include all grades earned at George Washington University and through the Consortium universities while the student is enrolled at George Washington University. The grades considered are for academic courses taken in fulfillment of degree requirements and as prerequisites for degree requirements, and not for other courses that may be taken (for example, EFL courses numbered 45 and below will not be considered).

Quality-point Index—Scholarship is stated in terms of the quality-point index. The index is obtained by dividing the student's total number of quality points by the total number of semester hours for which the student registered.

Quality points are computed from grades as follows: Each grade is assigned a numerical equivalent: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; *D*, 1.00 points; *F*, no points. The quality points for a course are obtained by multiplying the credit hours of the course by the numerical equivalent of the grade achieved. Courses marked *W* or *I* are not considered in determining the index. Courses marked *I* will be included once the *I* is converted to a regular letter grade. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities (see pages 214 and 228–29).

Mid-semester Warning—At the end of the seventh week of each semester, instructors report to the Dean the names of students whose scholarship is unsatisfactory. On receipt of a warning notice, students must consult with the appropriate instructor and their adviser immediately. The adviser may prescribe diagnostic tests and/or remedial study to be completed before the end of the current semester.

Probation—A full-time student (one taking 12 semester hours or more) will be placed on probation if his quality-point index is less than 2.0 for one semester or if he receives two or more grades of *F* in one semester or summer session. A part-time student (one taking fewer than 12 semester hours) will be placed on probation if his quality-point index is less than 2.0, or he has received two or more grades of *F*, when he has accumulated 12 semester hours over more than one semester or summer session. For academic purposes, a new grading period will begin once this accumulation is reached.

Removal from Probation—A full-time student will be removed from probation when his quality-point index is 2.0 or more and he receives no grade of

F in the semester after he is placed on probation. A part-time student will be removed from probation when his quality-point index is 2.0 or more and he receives no grade of *F* for the next 12 semester hours after he is placed on probation.

Suspension—The following cases constitute grounds for suspension: (1) receipt of two grades of *F* any time during a probation period; (2) placement on probation in two consecutive semesters (or the equivalent for part-time students); (3) receipt of four grades of *F* in any semester (or the equivalent for part-time students); (4) placement on probation for a third time, whether or not the probation periods are consecutive; (5) accumulation of a quality-point index of (a) 1.5 or less at the end of the sophomore year or upon completion of the 63rd credit in the student's curriculum, (b) 1.9 or less at the end of the junior year or upon completion of the 97th credit in the student's curriculum, or (c) 2.0 or less at any time during the senior year.

Department faculty may designate additional courses to be taken and grades to be received by students who fail to meet but come close to meeting the graduation requirements. Suspension may be held in abeyance until the conditions are or are not met.

Dean's Honors and Commendation Lists—The Faculty of the School recognizes meritorious scholastic achievement by a Dean's Honors List and a Dean's Commendation List, which contain the names of candidates for undergraduate degrees whose scholastic achievements satisfy all of the following requirements:

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.5 or higher for the Dean's Honors List and a quality-point index of 3.0 or higher for the Dean's Commendation List, with no more than one grade of *C*.
2. No grade below *C* may have been received during the qualifying period.
3. No disciplinary action may have been taken against the student.

The grades used to compute the quality-point index for eligibility for the Dean's Honors and Commendation Lists are those used to meet the SEAS graduation requirements. A student who receives a grade of *I* during a semester will not be placed on the Dean's Honors or Commendation List for that semester unless the *I* is removed no later than one month after the end of the marking period and the student continues to meet all the requirements for the Dean's Honors or Commendation List.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the Associate Dean. The Associate Dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the Associate Dean.

Graduation Requirements

See page 226 for general requirements for graduation.

RESIDENCE

A minimum of 30 semester hours must be completed in residence. Summer work may be counted. Unless special permission is granted by the Dean to study elsewhere, the work of the final year must be completed in residence.

SCHOLARSHIP

To be eligible for graduation a student must have (a) a quality-point index of at least 2.20 in those technical courses specified in the fifth through the eighth semester of the curriculum, and (b) a 2.00 overall average.

HONORS

With Distinction—A bachelor's degree may be conferred "With Distinction," at the discretion of the Faculty, if a student attains a quality-point index of 3.50 or higher on all work taken at this institution. To be eligible for this honor, a student must have completed at this institution at least one-half of this work required for the degree.

Special Honors—A bachelor's degree may be conferred with "Special Honors," at the discretion of the Faculty, for outstanding achievement in the student's senior year work on recommendation of the Faculty, under the following regulations:

1. The student must have candidacy for Special Honors approved by the department chairman representing the major field not later than the beginning of the senior year.
2. The student must meet such other conditions as may be set at the time candidacy is approved.
3. No student will be awarded Special Honors unless a quality-point index of at least 3.00 is achieved on all work taken at this institution.
4. To be eligible for Special Honors a student must have completed at this institution at least one-half of the work required for the degree.

UNDERGRADUATE CURRICULA

The four-year undergraduate curricula lead to the degree of Bachelor of Science, with parenthetic designation of the major; for example, Bachelor of Science (Electrical Engineering). Students who are deficient in preparation require a longer period; those who are admitted with advanced standing or who attend summer sessions can complete the requirements in less time.

The program of the first four semesters, with minor exceptions, is common to all curricula and provides the essential broad base of scientific principles and mathematical techniques necessary for the professional courses of the last four semesters, together with an appropriate background in the humanities and social sciences (see below).

A minimum total of 130 semester hours is required to qualify for the degree. Certain options may require more than the minimum. However, students are encouraged to elect additional course work above the required minimum to the extent that their interests and the School's offerings permit.

Degrees are offered in Civil Engineering, Electrical Engineering, Mechanical Engineering, and Operations Research and Computational Science. Students

in Civil Engineering may select options in Geotechnical Civil Engineering; students in Mechanical Engineering may select options in Computer-oriented Mechanical Engineering and in Energy-oriented Mechanical Engineering. Electrical Engineering provides options in Computer Science and Premedical Engineering.

The student is assisted by a faculty adviser, who approves the program each semester prior to registration. For the guidance of the student and the adviser, beginning freshmen who have not waived English Composition 9 or 10 through their English Composition Achievement Test scores or who have not received credit for a college-level calculus course must take the placement examinations in English and mathematics. A student who is deficient in mathematics may be required to take remedial work. Results on the English placement test determine the level of the English course the student will take.

Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students assists them in acquiring knowledge which will permit an understanding of the social and humanistic elements of the past and present and an analysis of problems facing society today. The ultimate goal is to help the engineer have a better understanding of society and an appreciation of the engineer's role and responsibilities within it.

Since the education of an engineering student is, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should not emphasize technical aspects and skills, but should rather consist of courses which broaden the outlook. As a consequence, courses in subjects such as accounting, finance, industrial management, introductory languages, and personnel administration should not be included in the humanities and social sciences program. On the other hand, courses in areas such as anthropology, economics, geography, history, literature, philosophy, political science, psychology, and sociology are considered appropriate.

Engineering students are required to prepare, with the assistance of their faculty adviser, a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours and must be approved by both the adviser and Department Chairman.

Modern Laboratory Facilities and Research Opportunities

Laboratories at the School of Engineering and Applied Science are constantly updated to keep them in line with current engineering practice. Assignments in the classroom and laboratory are arranged to supplement each other.

The learning experience is made more meaningful when coupled with research activities. Students may involve themselves in the various kinds of research activities in progress at SEAS. Research is being conducted in structural mechanics, fluid mechanics, thermal sciences, materials science, medical engineering, computer science, electronics, communications networks, energy technology, and other areas.

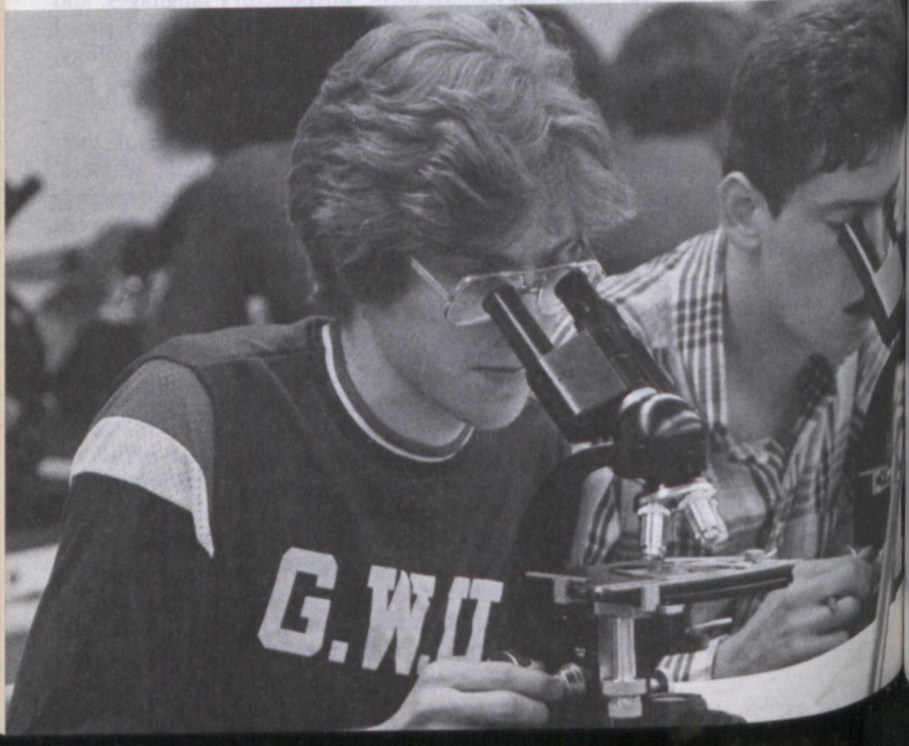
SEAS provides a wide variety of computing facilities for student and faculty use. Located on the fourth floor of Tompkins Hall, the SEAS Computing Fa-

cility includes an HP 3000 computing system with 12 time-shared interactive CRT terminals and remote telephone access; 14 Apple microcomputer disk-based computer systems; a VAX 11-780 computing system, primarily intended for color and black and white computer graphics research; and a laboratory for instruction in microprocessor software and hardware development.

A wide variety of high-level languages, as well as machine and assembly languages, are supported. The Facility provides technical and operational assistance to all users during normal operating hours: 9 a.m.-11:30 p.m. Monday-Friday, 12 noon-6 p.m. on weekends.

Additional computing facilities, not under the purview of the SEAS Computing Facility, are available to students and faculty at the Center for Academic and Administrative Computing (see page 229) and throughout the various specialized laboratories in SEAS.

The varied laboratory facilities available to complement classroom study and conduct research also include an MTS random-cycle fatigue testing system; a fully instrumented wind tunnel; a combined water tunnel and circulating water channel; a water pollution laboratory; an air pollution laboratory; a soil and foundation engineering laboratory; electrical engineering laboratory with oscilloscopes, signal generators, digital multimeters, power supplies, and other related equipment; microprocessor laboratory with modern microcomputers (Imsai Z80); digital computer laboratory with modern microcomputer trainers (6800 Microprocessors); a materials science and engineering laboratory with a electron scanning microscope; a thermal science laboratory; and general mechanical engineering and applied mechanics laboratories. Arrangements can also be made for use of special equipment at various government laboratories, such as the Naval Research Laboratory, the National Bureau of Standards, and the National Aeronautics and Space Administration.



Graduate Study

The School of Engineering and Applied Science offers graduate study leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science, and to the Professional degrees of Engineer and Applied Scientist.

In its graduate programs, the School, as it does in undergraduate study, adheres to the educational philosophy of increasing the knowledge and understanding of the individual student by concentration on principles and their application rather than by encyclopedic coverage of techniques and specialized detail. Each program is individually planned according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the "Programs of Study and Courses of Instruction" section of this catalogue beginning on page 56.

MASTER'S DEGREE PROGRAMS

The student's program may provide for broad coverage in a variety of fields or may be designed to provide a concentration in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a Master's thesis (equivalent to 6 semester hours). With the approval of the department the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses. All Master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an adviser. Programs of study are determined by any prerequisites established and by the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the appropriate department chairman.

Admission

Admission to graduate study toward a Master's degree requires an appropriate Bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, such as may be indicated by undergraduate grades, Graduate Record Examination scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he may be admitted to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he is deficient. In no case may the undergraduate courses thus taken fulfill any part of the requirements for the Master's degree.

For additional admissions requirements for the degrees of Master of Engineering Administration and Master of Science in the Department of Engineering Administration, see pages 175 and 179; for the degree of Master of Science in the Department of Operations Research, see page 198. Candidates for the degree of Master of Science in the Department of Electrical Engineering and Computer Science must have satisfied specific undergraduate requirements, depending upon the area of concentration.

ADMISSION PROCEDURE

Admission application forms are available at the School of Engineering and Applied Science. They must be submitted, together with the nonrefundable application fee of $25, to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 1 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of the student's record directly to the Manager of Engineering Admissions. Although not required, the applicant who has completed the Graduate Record Examination should request that the scores be sent to the School. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are outlined on pages 15–18.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

TRANSFER CREDIT

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy Master's degree requirements in this School. However, students must, with the approval of their adviser, petition to the appropriate Department chairman for such a transfer.

Registration

A graduate student may register for classes upon presentation of an official letter of admission or a Student Identification Card from the previous semester. No registration is accepted for less than a semester or one summer session.

Concurrent registration in this School and in another institution not a member of the Consortium of Universities of the Washington Metropolitan Area, Inc., or another division of this University requires the written permission of the Deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the Dean.

Dates and hours of registration are stated in the Calendar, page 4, and in the *Schedule of Classes* published in advance of each semester.

Master's Thesis

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate the ability to communicate the results of the work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course 299, the candidate must submit the thesis area to the appropriate department chairman, on the form obtained from the School office and approved by the faculty adviser. The candidate must submit the thesis title to the Dean, on the form available in the School office, at the beginning of the semester of expected graduation. Registration in thesis 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. Students may consult their adviser, but they have primary responsibility for the thesis.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis 300. In case a thesis is unfinished on the date specified, the student will be granted an additional semester. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time will be required and the student must reregister for thesis 300 and pay tuition as for a repeated course. The overall time limit for earning the degree (see page 31) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the School. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

Optional Master's Program without a Thesis

With the approval of the appropriate department, a student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses.

Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This Examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the Examination satisfactorily, the student's graduate status terminates.

Regulations

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 213-18; other University regulations, on pages 224-28.*

ATTENDANCE

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. They may attend only those classes for which they are registered. Students are expected to attend every meeting of the course in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

SCHOLARSHIP

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit (for satisfactory thesis completion); *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal.

Students who receive two grades of *F*, or three grades below *B*, are barred from further enrollment in graduate courses and, ordinarily, will not be readmitted to graduate study.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the grade of *I* *may* remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An incomplete which is not removed within one calendar year is automatically changed to an *F*.

A student may not repeat for credit a course in which the student has received a grade of *C* or above, unless required to do so by the department concerned. A written statement requiring the student to repeat such a course for credit must be submitted to the Registrar by the appropriate department chairman.

Pass-No Pass Grading System—SEAS students may take SEAS courses under the pass/no pass grading system, but credit for such courses cannot be used toward any degree program in SEAS.

GRADUATION REQUIREMENTS

Thesis—In addition to 6 credit hours of acceptable thesis, a student may graduate with either:

1. 24 credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 24 credit hours with no more than two grades below *B* of which only one *F* is permitted.

Non-thesis Option—A student may graduate with either:

1. 33 credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 33 credit hours with no more than two grades below *B* of which only one *F* is permitted.

Quality-point Index—Scholastic standing is computed in terms of the quality-point index obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; *F*, no points, for each semester hour for which the student registered. Courses marked *W* or *I* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities.

RESIDENCE AND CONTINUOUS STUDY

All work for the degree must be done in residence on the campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and the student must apply for readmission to the Master's degree program under whatever conditions and regulations are in effect at that time.

TIME LIMITS

A full-time student in the Master's program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the student's first graduate-student status registration in prerequisite or graduate courses. A part-time student in the Master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman and approved by the Dean.

PROFESSIONAL DEGREE PROGRAM

The School of Engineering and Applied Science has established the Professional degree program to provide an educational program for those students who are

interested in pursuing course work beyond the Master's degree, with emphasis on applied subject material rather than on basic research.

Successful completion of the Professional degree program leads to the degree of Engineer or degree of Applied Scientist.

In the Professional degree program, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual by concentration on principles and their application. This approach should provide the students with a technical flexibility to enable them to adapt successfully to rapidly changing technology. Each program is individually planned according to the student's background and needs and is subject to departmental requirements.

The Professional degree program has been designed to satisfy the needs of industry and government for highly trained and educated technical personnel in engineering and applied science.

Professional Degree Study Programs

The Professional degree program provides graduate study in those fields of engineering or applied science in which the School has adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives.

The student's program may provide for broad coverage in a variety of fields or may be designed to provide a concentration in particular areas. The minimum program consists of 30 semester hours of approved graduate courses beyond a Master's degree. Students whose graduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Admission

Admission to graduate study toward the Professional degree requires an appropriate Master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience.

REQUIREMENTS

1. *Engineer*—To study toward the degree of Engineer, an applicant must possess a Master's degree and a bachelor's degree in an area of engineering.

2. *Applied Scientist*—To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in either engineering, mathematics, or natural science; and a Master's degree in either engineering, natural science, mathematics, or administration. Applicants having an equivalent quantitative background may be considered as special cases by the respective departments.

Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

ADMISSION PROCEDURE

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with the nonrefundable

application fee of $25, to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 15 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of the student's record directly to the Manager of Engineering Admissions. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are on pages 15–18.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

TRANSFER CREDIT

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*) beyond a Master's program, which must have been earned in the five years preceding the start of study toward the Professional degree, may be accepted in transfer when applicable to satisfy Professional degree requirements in this School. However, students must, with the approval of their adviser, petition the appropriate Department Chairman for such a transfer.

Program of Study

Upon admission, the student is assigned an adviser. Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of studies for each Professional degree candidate must be approved by the student's adviser and the appropriate Department Chairman.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate and graduate courses before being admitted to Professional degree candidate status. In no case may these courses thus taken fulfill any part of the requirements for the Professional degree.

Each individual department may require the degree candidate to undertake and defend the results of a technical design project, development problem, or the preparation of a comprehensive technical report to demonstrate the candidate's ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study. When applicable, the student will be informed of this requirement by the faculty adviser at the time the student's program is being formulated.

In no case, however, will this project be more than 6 credit hours out of a minimum of 30 credit hours.

Scholarship

No student studying for the Professional degree may receive more than two course grades below *B*. If more than two course grades below *B* are received, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of 3.00 to receive the degree.

Time Limits

A full-time student in the Professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the first graduate student status registration in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Upon expiration of leave of absence, readmission is required under the conditions and requirements in effect at the time of the student's readmission.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Interrelationship with the Doctoral Program

Candidates for the D.Sc. degree or Professional degree who are in good academic standing may, with the approval of the faculty adviser and department chairman, transfer from one degree program to the other, if they meet necessary qualifications and requirements as specified by the appropriate department.

Residence and Continuous Study

All work for the degree must be done in residence on the campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and the student must apply for readmission to the Professional degree program under whatever conditions and regulations are in effect at that time.

DOCTORAL DEGREE PROGRAM

The School of Engineering and Applied Science offers a program of advanced study and research leading to the degree of Doctor of Science. This program is limited to those fields in engineering or applied science in which a discipline has been established and for which the University has or can arrange adequate resources.

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest.

The program for the degree is divided into two stages. The first—made up of a study of interrelated fields of learning which supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a special field and the presentation of such research findings in a written dissertation—culminates in the final examination.

Admission to Doctoral Study

A satisfactory Master's degree from an accredited institution is required, together with acceptable personal qualities and a capacity for creative scholar-

ship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

ADMISSION PROCEDURE

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with a nonrefundable application fee of $25, to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052. The prospective doctoral student seeking admission should apply before June 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which the student received the Master's degree; one of these, if possible, should be from the Master's adviser. The letters should be addressed to the appropriate department chairman.

English language and other pertinent requirements for international students are given on pages 15–18.

Language Requirement

A doctoral student should maintain a broad outlook as he pursues his study, and therefore must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language, preferably Russian, must be demonstrated before admission to the qualifying examination. Students who wish to satisfy this requirement with a language other than Russian, must obtain the approval first of the doctoral adviser, then of the Department Chairman; permission to use a language other than Russian will be granted on the basis of its importance to the student's field of interest.

Tool Requirement

In addition to the language requirement, an examination in a tool requirement (*e.g.*, computer programming) may be established by the various departments.

Study for the Qualifying Examination

Upon admission to the first stage of the program, *i.e.*, study of interrelated fields culminating in the qualifying examination, the student is assigned a faculty adviser who directs his studies.* The adviser approves appropriate fields of study to insure the student's breadth of knowledge and to support research in the central field of interest, gives advice concerning the scope and content of fields of study, and guides preparation for the qualifying examination. Programs of study are normally structured to include a major field of study and two minor or supporting fields.

A minimum of 30 semester hours of credit in a formal program at the graduate level beyond Master's study is required. In many cases, particularly when

*In some departments, instead of a faculty adviser, a faculty committee may be appointed to approve programs, direct study, and carry out all other responsibilities of the faculty adviser.

the student undertakes a doctoral program in a field other than that in which the student obtained the Master's degree, the program of studies exceeds 30 semester hours.

Students admitted to doctoral study are encouraged to undertake one year of full-time study on campus. In general, the adviser will require the student to register for a minimum of 6 semester hours of course work in every semester except the summer sessions.

Transfer of Credit

Up to 6 semester hours of credit earned in courses completed with the grade of *A* or *B* while enrolled in a doctoral program at another accredited institution may be accepted in transfer to satisfy doctoral requirements of this School, subject to the approval of the student's adviser and the Department Chairman. Credit earned in courses completed more than five years prior to admission to the doctoral program will not be accepted in transfer, and some departments may require that transfer credit must have been earned within a shorter period of time before admission.

The Qualifying Examination*

The purpose of the qualifying examination is to ascertain that the student's background and intellectual development are adequate to support doctoral research in the central field. Qualifying examinations may be written or oral, or both, and are scheduled over a period of several days. They are conducted only during the fall and spring semesters on dates established by the departments and are administered by a faculty committee. Upon favorable report of the examiners to the Dean through the appropriate department chairman, the student is admitted to candidacy for the degree; the student then begins specialized study and research under the supervision of a designated member of the faculty or, in special instances, an outstanding engineer/scientist who is not a member of the faculty.

The qualifying examination is the principal means used to determine the student's ability to qualify as a candidate for the doctoral degree and to enter the second stage of the program.

At the discretion of the committee which prepared the examination, the doctoral student may be given a second opportunity to qualify for candidacy in the event of failure in any part of the qualifying examination. In general, the entire qualifying examination must be retaken by the student in order to qualify for candidacy.

Scholarship

To be admitted to the qualifying examination, the doctoral student must achieve an overall quality-point average of 3.20 (quality points are computed as follows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; and *F*, no points). No doctoral student may receive more than two course grades below *B*. If the student does receive more than two course grades below *B*, the graduate study is terminated and further enrollment is prohibited. Courses in which the student earns grades below *B* are not included in the total semester-hour requirement for the degree. Students who receive any grade below *B* are required to consult with their adviser for a review of their program of study and discussion of possible changes therein.

* Some departments may administer a pre-qualifying examination prior to completion of the study program.

Research, Dissertation, Final Examination

The student admitted to candidacy for the degree of Doctor of Science requests as Director of Research, the member of the faculty under whom the student wishes to conduct research. The faculty member may accept or reject such request. The research area is approved by the Director. Throughout the remainder of the doctoral program the candidate conducts dissertation research directly under the Director. However, the student is not precluded from consulting with other members of the faculty, as may be required, on an informal basis, and may be encouraged to do so by the Director of Research. A committee of the faculty consisting of three members including the Director as chairman will advise in the final preparation of the dissertation. The Department Chairman appoints such a committee on the recommendation of the Director of Research. Work on the dissertation is equivalent to a minimum of 24 semester hours. See page 214 for minimum hour-loads for doctoral students.

THE DISSERTATION

A dissertation is required as evidence of ability to perform original scholarly research and to present and interpret the results. The student is solely responsible for the content of the dissertation.

The aim of the student in this stage of candidacy is the production of a dissertation which embodies the results of an extended original study and which includes material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to publish the results of the research as soon as possible after the student receives the degree and to submit copies of the published material to the Dean. Credit must be given in the publication to the fact that the material is abstracted, summarized, developed, etc., from a dissertation submitted to George Washington University in partial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the appropriate department five complete copies of the dissertation and an abstract (not to exceed 600 words) of the dissertation no later than the date specified in the calendar. The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the School office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of the dissertation, and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library, where bound copies are available for circulation.

THE FINAL EXAMINATION

Upon acceptance of the dissertation by the committee, consisting of the Director and two other faculty members of this School, which has assisted in supervising its final preparation, the candidate is presented for the final examination.

The final examination is oral and is open to the public. The candidate must demonstrate a mastery of the special fields of study and of the materials and techniques used in the research. The committee of examiners will consist of not less than five members, three of whom must be full-time faculty members. The committee may include qualified experts brought to the University especially to participate in the examination. The Director of Research serves as Advocate for the candidate. When the candidate satisfies the examining committee of the high quality and originality of the candidate's contribution to knowledge as well as the mastery of the scholarship and research techniques of the field, the committee of examiners recommends the candidate for the degree of Doctor of Science. The final examination is conducted only during the fall and spring semesters. The candidate should consult with the appropriate department chairman as to possible dates for the examination.

Residence and Continuous Study

All the work for the degree must be done in residence on the campus, except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the registration, and the student must apply for readmission to doctoral study under whatever conditions and regulations are in effect at that time. In case of incapacity or other legitimate reasons, the student may be granted a leave of absence of up to one year. Extension of such leave will require special request to and approval of the appropriate department chairman. During approved leave of absence, the student must maintain continuous enrollment. The time period for completion of all requirements for the degree will be adjusted on the basis of the approved leave of absence.

In general, one year of study is the minimum amount of time to be spent in preparation for the qualifying examination. The qualifying examination must be completed within five years of the date of admission, and the entire degree program must be completed within seven years. After admission the student may apply for the qualifying examination whenever the student feels properly prepared. A minimum of two years of full-time study and research should be expected in meeting the requirements for the degree.

Special Programs

INSTITUTE FOR THE STUDY OF FATIGUE, FRACTURE, AND STRUCTURAL RELIABILITY

The basic objective of the Institute for the Study of Fatigue, Fracture, and Structural Reliability of the School of Engineering and Applied Science is to develop an interdisciplinary approach to fatigue research through close cooperation of research workers from different fields. The Institute deals principally with the study of the physical mechanism of damage initiation, in order to establish principles for the rational design of metal alloys of superior fatigue performance on the one hand, and to develop advanced methods of fatigue design and reliability on the other. Because of the large volume, past and current, of straight fatigue testing of standard test specimens in industrial, govern-

ment, and university laboratories, no testing of this type is generally conducted by the Institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the Institute. In addition to advancing interdisciplinary research, the Institute provides specialized training for graduate students.

The Institute conducts seminars, issues technical reports, and supplies information, lectures, and consultations to many government and industrial research and development laboratories.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

The Institute for Management Science and Engineering defines and develops new analytical management techniques required to keep pace with an ever-expanding technology. It provides a multidisciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. The principal academic fields directly involved are operations research, mathematics, statistics, economics, and the computer sciences.

The programs of the Institute are concerned with important educational and public-service needs for conservation of national resources. Such programs require full-time interaction among students, faculty, and staff in ways possible only at universities. Through its Program in Logistics, the Institute performs research leading to the development of a science of logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts. Other programs involve optimization, reliability, queuing, forecasting, and cost benefit analyses.

Participation by faculty members and graduate students from all schools in the University is encouraged as consistent with the multidisciplinary objectives of the Institute. Qualified graduate students may obtain financial support through research assistantships, with thesis and dissertation efforts ordinarily being the major work responsibilities. Reliance is also placed on staff research specialists, and there are special provisions for substantial contributions from distinguished visitors from government, private industry, and other universities.

The Institute disseminates its results through seminars, colloquia, conferences, and a special series of monographs. All research is unclassified.

INTERNATIONAL WATER RESOURCES INSTITUTE

The International Water Resources Institute was created to foster a multidisciplinary approach to the planning, development, and operation of water resources systems and the solutions to water resources problems on both the national and international levels.

The Institute emphasizes basic and applied research, technical development, transfer of knowledge, professional and scientific services, and special educational needs within the University and abroad.

The Institute supplies information to various government agencies and private concerns nationally and internationally and conducts seminars. It thus creates an international flow of knowledge of water resources problems and their possible solutions.

INSTITUTE FOR INFORMATION SCIENCE AND TECHNOLOGY

The Institute for Information Science and Technology, of the Department of Electrical Engineering and Computer Science, operates as a multi-disciplinary research organization, with its foundation in the field of science and engineering. It brings together the strength of disciplines from both the physical sciences and the social sciences, including law, education, government, psychology, political science, engineering, mathematics, geography, and others, in order to understand human-machine interactions and to understand appropriate designs for effective information systems for the future. The Institute operates with a core staff and relies on faculty and research contributors from George Washington University, as well as a broad range of other sources from government, industry, and academe. Visiting scholars and fellows from government and industry fill important research positions while pursuing advanced studies.

The Institute is organized to conduct interdisciplinary educational and training programs by integrating mid-level scientists and managers into Institute research programs in order to provide them with greater insight into the latest research findings in the field of information science and technology. There is a deliberate mix of permanent and adjunct staff: government, industry, and university staff; practitioners and researchers; senior researchers and students—a cross-fertilization of the spectrum of skills and roles that can be brought to bear in the field of information science.

The Institute for Information Science and Technology produces research publications, grant and contract reports, and scholarly papers; systems designs and developmental demonstrations; continuing education programs, seminars, and conferences; and trained staff and alumni.

THE GWU/NASA-LANGLEY GRADUATE PROGRAM

George Washington University, in cooperation with the National Aeronautics and Space Administration's Langley Research Center, has a full-resident graduate engineering program at NASA-Langley, in Hampton, Va., approximately 200 miles south of Washington, D.C.

The program is open to qualified NASA employees and area residents. Courses may also be taken by nondegree students, with the approval of the instructor. Students may be permitted to transfer a maximum of 6 semester hours of approved graduate course credit from other accredited institutions.

Courses in the program are taught by NASA scientists and engineers and the faculty of the School of Engineering and Applied Science. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized whenever feasible.

The program at NASA-Langley leads to the degrees of Master of Science and Doctor of Science (by special permission of the appropriate department chairman) and to the Professional degree of Engineer in the fields of acoustics, aeronautics, environmental modeling (M.S. degree only), fluid mechanics and thermal sciences, solid mechanics and materials engineering, structures and dynamics, and electrical engineering and computer science (M.S. degree only).

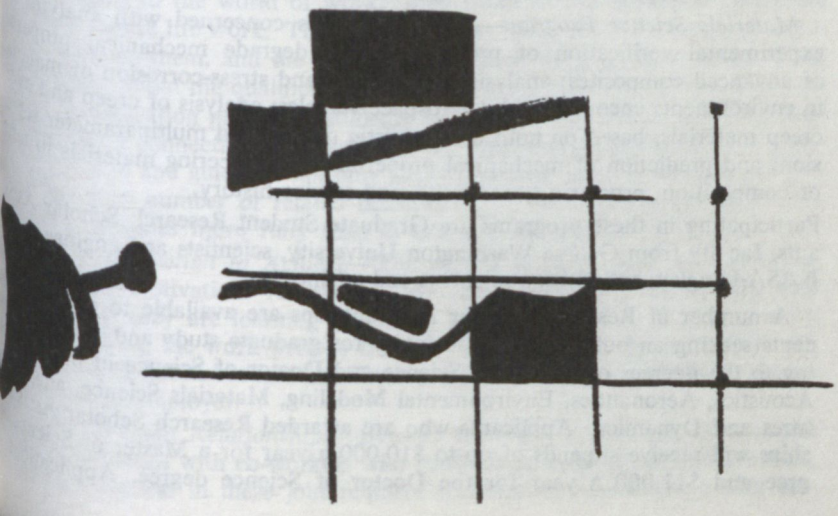
Information regarding this program may be obtained from John L. Whitesides, Jr., GWU-NASA Program, Mail Stop 69, NASA-Langley Research Center, Hampton, Va. 23365.

The GWU/NASA-Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The Joint Institute for Advancement of Flight Sciences was established in 1971 through the combined efforts of the National Aeronautics and Space Administration's Langley Research Center and the George Washington University's School of Engineering and Applied Science. The objective of the JIAFS program is to meet the nation's ever-increasing needs in the advancement of science, engineering, and technology and to prepare qualified students for careers in research, development, design, and teaching. The Institute, which is located at the Langley Research Center in Hampton, Virginia, is dedicated to the advanced training of students and professional engineers in acoustics, aeronautics, environmental modeling, materials science, structures and dynamics, and other relevant areas, and serves to provide a center for advanced research by bringing together researchers and scholars from these fields for the exchange of ideas and findings. It is also the purpose of the Institute to provide the necessary facilities for qualified researchers and scholars who want to engage in research work in these areas.

The organization of the Institute consists of a director, Frank Hohl, Chief Scientist, NASA-Langley Research Center, and a co-director, Harold Liebowitz, Dean of the George Washington University's School of Engineering and Applied Science.

The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research assets and facilities of the NASA-Langley Research Center. These opportunities also enable students to involve themselves in research projects that excite their interest and permit them to associate with prominent visiting members who are working on related problems. Most of the faculty and NASA scientists conduct research, and students take part in the intimate asso-



ciation of research and instruction from the day of their arrival. It is believed that the experience of the students during their stay at NASA-Langley Research Center will be highly rewarding and beneficial.

The current education and research programs are the following:

Acoustics Program—This program is concerned with the problems of alleviating noise and with providing a technical base for design of acceptable aircraft and space vehicles, noise resistant structures, and ground transportation systems. Areas of research interest include boundary-layer noise, duct acoustics, jet noise, nonlinear problems in acoustics, structural response to noise, and mechanical and acoustical coupling problems.

Aeronautics Program—This program deals with advanced flight concepts of various types of aircraft, including areas of performance, flight dynamics, instrumentation, guidance and control, aeroelasticity, and systems analysis. Specific research areas currently being investigated include aerodynamic analysis of jet augmented wings, theoretical fluid mechanics, performance, stability and control of aircraft, wind tunnel and flight testing of aircraft, airfoil aerodynamics, stall-spin characteristics of aircraft, and experimental evaluation of aircraft handling characteristics.

Structures and Dynamics Program—This program is designed to provide a basic understanding and working knowledge of some key areas pertinent to structures, solid mechanics, and dynamics technology including computer-aided design; optimum design of aircraft and of aerospace and other structures; and the dynamic and aeroelastic response of large and complex structures. Emphasis will be placed not only on these individual areas but also on their interface and interaction.

Environmental Modeling Program—This program is aimed at developing mathematical models of various aspects of atmospheric energy and mass transport and in applying these models both to the prediction of pollutant distribution and transport and to the interpretation of satellite and aircraft measurements. Because of the complexity of the earth-atmosphere system, simplified models are necessary to understand the effects of pollutants on the energy balance, the atmospheric circulation, and the chemistry of the system.

Materials Science Program—This program is concerned with analytic and experimental verification of processes which degrade mechanical properties of advanced composites; analysis of corrosion and stress-corrosion of materials in environments encountered by aerospace vehicles; analysis of creep and cyclic creep materials, based on both deterministic models and multiparameter regression; and prediction of mechanical properties of engineering materials in terms of composition, processing conditions, and service history.

Participating in these programs are Graduate Student Research Scholar Assistants, faculty from George Washington University, scientists and engineers from NASA-Langley, and visiting scientists and engineers.

A number of Research Scholar Assistantships are available to qualified students seeking an outstanding opportunity for graduate study and research leading to the degrees of Master of Science and Doctor of Science in the fields of Acoustics, Aeronautics, Environmental Modeling, Materials Science, and Structures and Dynamics. Applicants who are awarded Research Scholar Assistantships will receive stipends of up to $10,000 a year for a Master of Science degree and $11,000 a year for the Doctor of Science degree. Applications, a

JIAFS brochure, and additional information may be obtained from Dr. John L. Whitesides, JIAFS—George Washington University, Mail Stop 169, NASA-Langley Research Center, Hampton, Virginia 23665.

COOPERATIVE EDUCATION PROGRAM IN ENGINEERING

Cooperative education is a process of education which formally integrates the student's academic study with work experience in cooperating employer organizations. The usual plan is for the student to alternate periods of college study with periods of experience in appropriate fields of industry and government. The experience periods are considered an integral part of the student's education. Through the interaction of the study and work experiences, the student enhances academic knowledge, personal development, and professional preparation. The teaching faculty, the coordinators, and the employing supervisors share in the educational process of the cooperative student.

Advantages of Cooperative Education

Combines Theory and Practice—By coordinating the work experience in industrial and governmental organizations with the campus education program, theory and practice are closely integrated, and students find greater relevance in their studies. As a result of this alternation between academic and industrial environments, the student tends to understand the role and meaning of each environment, with a deeper appreciation for each.

Helps Finance Educational and Living Expenses—The student's earnings will contribute substantially to financing his own education and living expenses, leading to independence and contributing significantly to self-esteem and confidence. Working experience usually increases in difficulty and responsibility as the student progresses through the academic curriculum, and the salary of the student increases accordingly.

Serves as a Bridge to the Future—Cooperative education helps markedly to orient students to the world of work. Most students are genuinely concerned about their future life work. They want to know more about the range of occupations open to them, and the potentials and limitations of these fields. They want to know about the qualifications demanded and their own fitness. Through cooperative education programs, students have opportunities for exploring their own abilities in connection with real jobs, and they find a direct means of gaining information and guidance not only in the occupations in which they are employed but in a number of related fields as well. They have a chance to test their own aptitudes more fully than is normally possible on campus.

Increases Motivation to Achieve—The coordination of work and study increases student motivation. As students see connections between jobs they hold and the things they are learning in school, greater interest in academic work develops. During the work periods there is a tendency for the student to develop good work habits because his efforts as a productive and salaried employee are rated by the employer.

Enhances Human Relationships—Because the work experiences involve the students in relations with co-workers who come from a variety of backgrounds, and because success in these jobs requires constructive relationships with col-

leagues, most students in cooperative education develop deeper understanding of other people and greater skills in human relations.

Augments Development of Maturity—For many students the work experience contributes to an increased sense of responsibility for their own efforts, more dependence on their own judgments, and a corresponding development of maturity. In addition, the student's role as a team member in a real and productive working environment inculcates a seriousness of life and purpose which is often delayed for the traditional college graduate.

Responsibilities of the Cooperative Student

The cooperative student working in association with the professionals in the field must adopt professional standards of conduct. Such a student is also a representative of the George Washington University School of Engineering and Applied Science. After each work period the student prepares a report describing the duties and responsibilities at work, and the supervisor sends an appraisal of the student's work performance to the Cooperative Program Coordinator. These reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the employer, and George Washington University. The student's responsibilities extend equally to each of the other two members of the partnership, and the partnership cannot be altered during the program without the knowledge and consent of all.

The cooperative student must maintain continuous enrollment in the School for each semester the student is away from the School on a work period. Failure to do so breaks the student's registration, and the student must apply for readmission to the undergraduate degree program under whatever conditions and regulations are in effect at that time.

Why Employers Participate in Cooperative Education Programs

Industry and government agencies have found that cooperative students are valuable employees. Generally speaking, they are alert and energetic young people who, stimulated by a definite goal, return more than a day's work for a day's pay. Graduates of the cooperative program represent a good source of well-trained manpower. The training period provides an opportunity for the employer to evaluate the student as a prospective permanent employee. Employers feel that this program is an important part of their effort to attract well-qualified employees. At the same time, the student is able to evaluate the employer in terms of future plans and interests. About half of the cooperative graduates establish such mutually beneficial relationships with their employers that they remain in permanent employment after graduation, with a substantial head start in their careers.

It is emphasized, however, that neither the student nor the employer is obligated for permanent employment after graduation. Industry and government agencies consider participation in cooperative education as a long-range investment rather than a current expense. As a partner with the University, the employer is engaged in a joint effort to develop young talent more fully, thus assuring better education for the student, improved utilization of the graduate, and greater cooperation with the University.

Scholastic Requirements

Students entering the program must be in good academic standing and usually must have completed at least two semesters of college-level academic study prior to their first full-time work assignment. To remain in the program, the student must maintain a passing average and perform satisfactorily for the employer.

Living Accommodations

Arrangements will be made for students in the cooperative program to retain their dormitory and dining privileges at the University, if they so desire, during the work periods. During this time, they will also retain full student privileges and have access to all University facilities. Faculty will be available for consultation by appointment.

Work-Study Schedules

At this time, individual schedules are being arranged with the various employers in Washington and other areas. Since each employer operates differently, special schedules are arranged which are mutually satisfactory to the student, the employer, and the School.

Generally, after the student has successfully completed the first year of study, a schedule is arranged with the employer. Many employers will require the student to work during the summer immediately following the freshman year. The student returns to the School for the sophomore year, working again during the second summer. Beginning with the third year, students alternate between employer and classroom each semester for the next two years, returning to the classroom for the fifth and final year. An alternate method is to work a full academic year and then return to school. Schedules for transfer students are arranged on an individual basis according to the number of credit hours transferred and the employer's requirements.

Tuition Aid

Under the Tuition Aid Program offered by certain employers, up to 50 percent of the cost of tuition, textbooks, and fees (exclusive of room and board) may be granted. If tuition assistance is received, the cooperative student will have to agree to serve as an employee after graduation for a period to be determined by regulations in effect at that time. As a civil service employee, the co-op student is eligible for many federal benefits, including annual leave, sick leave, paid holidays, health benefits, and life insurance.

Applications

Applications for the Cooperative Education Program from registered or transfer students should be submitted at least ten weeks prior to the beginning of the first work period. It is recommended, however, that applications be submitted four months in advance of the work period. Transfer students who meet admission requirements may apply for a work assignment during the summer or semester just prior to their registration at this University.

UNDERGRADUATE DUAL-DEGREE PROGRAMS WITH BOWIE STATE COLLEGE, HAMPTON INSTITUTE, HOOD COLLEGE, MANSFIELD STATE COLLEGE, ST. JOSEPH'S COLLEGE, ST. MARY'S COLLEGE OF MARYLAND, ST. THOMAS AQUINAS COLLEGE, AND VIRGINIA COMMONWEALTH UNIVERSITY

The School of Engineering and Applied Science, Bowie State College, Hampton Institute, Hood College, Mansfield State College, St. Joseph's College, St. Mary's College of Maryland, St. Thomas Aquinas College, and Virginia Commonwealth University, all of which are accredited four-year degree-granting institutions, have established dual-degree programs that join general education and career education in a unique and comprehensive experience. These programs are in addition to the engineering programs already offered on the campus at George Washington University.

Bowie State College, Hampton Institute, Hood College, Mansfield State College, St. Joseph's College, St. Mary's College of Maryland, St. Thomas Aquinas College, and Virginia Commonwealth University offer several four-year degree programs in a variety of disciplines. To provide opportunity for careers in engineering, these institutions joined with the School of Engineering and Applied Science, which offers an accredited four-year program in engineering.

Students enrolled in the dual-degree program first follow a general plan of study for three years at Bowie State College, Hampton Institute, Hood College, Mansfield State College, St. Joseph's College, St. Mary's College of Maryland, St. Thomas Aquinas College, or Virginia Commonwealth University. This program is based on the social sciences, humanities, and the preparatory background engineering courses in mathematics, physics, and chemistry, which help develop broad cultural perspectives, analytic abilities, and communication skills.

After successful completion of the first phase of study, students then follow a two-year career program in engineering at the School of Engineering and Applied Science. During this phase of the study, students may specialize in any of the following areas of engineering, which are also offered in George Washington University's regular four-year programs:

1. Civil Engineering or the following option: Geotechnical Civil Engineering.
2. Electrical Engineering or the following options: Computer Science, Premedical Engineering.
3. Mechanical Engineering or the following options: Computer-oriented Mechanical Engineering, Energy Resources, and Power.
4. Operations Research and Computational Science.

Students may begin their education at Hampton Institute, Bowie State College, St. Joseph's College, Hood College, Mansfield State College, St. Mary's College of Maryland, St. Thomas Aquinas College, or Virginia Commonwealth University and then obtain a B.S. in an engineering area from George Washington University. This unique academic background provides the student with many options in choosing a profession upon graduation. The student may go into engineering practice, continue study for advanced degrees, or enter other professional areas such as law, medicine, or teaching.

Dual-degree students, while at Hampton Institute, may participate in the Summer Training Program. In this program, students may work for a 12-week

period during the summer at the Joint Institute for Advancement of Flight Sciences at the National Aeronautics and Space Administration's (NASA) Langley Research Center in Hampton, Va., obtaining valuable work experience in a first-rate laboratory while earning funds for the following academic year. This program may be made available to some prefreshmen who desire to work upon graduation from secondary school.

Dual-degree students may avail themselves of summer employment through the George Washington University's Cooperative Education Program in Engineering prior to their actual attendance at George Washington University.

In George Washington University's Cooperative Education Program in Engineering (see pages 43–45), a student may work summers and one or two academic semesters and earn sufficient funds to help pay expenses while obtaining valuable engineering experience.

The dual-degree program offers the student time to become acclimated to college life and study at a reasonable cost while preparing for an exciting and rewarding profession.

For further information write or call Mr. John W. Ponds, Mathematics Department, Bowie State College, Bowie, Maryland 20715, (301) 262-3350; or Dean of Admissions and Registrar, Hampton Institute, Hampton, Virginia 32668, (804) 727-5328; or Dr. Patricia M. Bartlett, Hood College, Frederick, Maryland 21701, (301) 663-3131; or Dr. George Mullen, Mansfield State College, Mansfield, Pennsylvania 19933, (717) 662-4275; or Sister Betty Markham, St. Joseph's College, West Hartford, Connecticut 06117, (202) 232-4571; or Dr. Rosemary R. Hein, St. Mary's College of Maryland, St. Mary's City, Maryland 20086, (301) 994-1600; or Sister Marie McNamee, St. Thomas Aquinas College, Sparkill, New York 10976, (914) 359-1279; or Dr. Billy W. Sloope, Virginia Commonwealth University, Richmond, Virginia 23284, (804) 257-1313; or Manager, Engineering Admissions, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052 (202) 676-6158.

CONTINUING ENGINEERING EDUCATION PROGRAM

Today most engineers and their employers are well aware of the rapid advances of knowledge in science and technology. The inability to understand and to make timely applications of new technologies can mean both personal and corporate failure. To prevent this potential obsolescence, engineers must involve themselves in a continuing program of technical reading and organized learning.

The School of Engineering and Applied Science meets this need with a comprehensive program of noncredit courses. The program's objective is to increase the competence of practicing engineers rather than to grant further academic degrees. Staff reorganizations require many engineers to change their specialties or to take on additional duties within their present jobs. Continuing engineering education can provide the education and skills the engineer needs to effectively make these changes. Continuing engineering education also aids in qualifying for promotions and in maintaining certification in certain professional fields.

The program will present about 500 noncredit courses this year. About half of them last for five days (30 classroom hours), while others are for two, three,

or four days. Some courses are presented in the evening (two-hour sessions once a week for 8 to 12 weeks), or on Saturday morning. Presentation of theory is often augmented by workshops to give registrants practice in the specific discipline. All courses stress practical applications. Students from all over the nation and from many foreign countries have participated in courses. The variety of experience and background of these students enriches the classroom discussions.

January 1980 marked the initiation of a major undertaking to make this program available in Europe at the International Congress Center in Berlin. Seventy-five courses were offered during the first year, using qualified European lecturers when feasible. Those areas of advanced technology in which the United States is a leader will be emphasized.

Subjects which have been presented in the Continuing Engineering Education Program include:

Computers

ADA Computer Programming
ADP Security
ADP Systems Risk Analysis
APT Computer Language and Workshop
Bubble Domain Memory Technology
COBOL Programming
Comparative Data Base Management Systems
Computer-Assisted Makeup and Imaging Systems
Computer-Aided Design/Manufacturing
Computer Cryptography
Computer Communications Systems and Networks
Computer Equipment Registration
Computer Graphics Systems: Design and Applications
Computer Graphics: Hardware and Software
Computer-Aided Circuit Design
Computer Security
Computer Performance Evaluation
Configuration Management of Software Programs
Cryptographic Methods for Data Protection
Data Base Management: Technology and Communication Products
Data Bases for Minicomputers and Networks
Data Compression: Techniques and Applications
Design and Selection of Minicomputer Systems
Designing Data Communication Networks
Designing Human Factors in Computer Graphics
Digital Integrated Circuits
Distributed Information Systems
Distributed Processing: Concepts and Techniques
Embedded Computer Resources
Energy Modeling
Heuristics in Artificial Intelligence
Interactive Computer-aided Circuit Design
Introduction to ADP
Introduction to EDP and CPL
Linear Programming
Local Area Computer Networks
Magnetic Bubble Memory Technology
Microprocessors
Microprocessors and Microcomputers
Microprocessors: Machine Language Programming
Microprocessors and Microcomputers: Theory and APS
Microprocessors and Microcomputers Workshop
Microcomputers in Control Systems
Mini/Microcomputers/Processors for Non-Electrical Engineers
Minicomputer Technology
Modular Software Design
Modern Algorithms for Estimation and Control

Modern Software Development Techniques for Managers
PASCAL Computer Programming
Programming the 6502
Programming the 8080 in Machine and Assembly Languages
Software Design for Data Communication Systems
Software Engineering and Quality Assurance
Software Quality Assurance
Software Reliability Models
Statistical Quality Control for Software Engineering
Standards, Specifications, Codes, and Technical Data
Structured Analysis, Design, and Testing of Computer Systems
Structured Programming and Software Engineering
The Computer Language BASIC
Tools for the Data Analyst
Understanding Computer Hardware and Software
Using Computer-Assisted Instruction in Training
Voice Input-Output: Communications with Machines

Electronics

Advanced Electro-Optics Engineering
Advances in Space Mapping Techniques
Advances in Electronics Technology
Airborne Radar Systems
Air Collision Avoidance Systems Design
Antennas for Radar, Avionics, and Electronic Warfare
Applied Digital Control Systems
Applications of Lasers
Applications of Transport Calculations
Applications of CCD and SAW Devices
Applied ECM
Avionics
Cyclotron Maser
Design and Prediction of Sonar Systems
Design of Digital Control Systems
Digital Filters
Digital Image Processing of Earth Observational Sensor Data
Digital Geographic Information Systems
Digital Electronics for Non-Electrical Engineers
Digital Electronic Switching Systems
Digital Signal Detection and Estimation
ECM and ECCM for Digital Communications
Electro/Fiber Optics and Lasers for Non-Electrical Engineers
Electromagnetic Pulse
Electronic Display Technologies and Applications
Electronic Navigation Systems
Engineering of Very Large Scale Integration (VLSI)
Fiber and Integrated Optics
Fiber Optics Systems Design
Frequency Management
Integrated Circuit Engineering
Intense Charged-Particle Beams
Lightning Protection
Optical Engineering Including Electro-Optics
Physical and Topological Design Concepts for Networks
Radiowave Propagation and Systems Concepts/COMSAT
Radar Fundamentals for Technical Managers
Radar ECCM
Radar Signal Processing and Automatic Detection
Remote Sensing for Global Resource Applications
Solidstate Electronics for Non-Electrical Engineers
Synthetic Aperture Radar with Remote Sensing Applications
Synchronization in Spread Spectrum Systems
TDMA Satellite Systems Engineering
World Trends in Digital Networks, Transmission and Switching

Mathematics/Statistics/Quality Control/Reliability/Safety

Analysis of Variance
Applications of Reliability and Risk Analysis
Aviation Maintenance Management
Aviation Safety Management
Bayesian Statistics for Engineers and Scientists
Case Studies in Reliability
Contingency Tables
Deterministic and Stochastic Control Systems Optimization and Computer Technology
Fault Tree Analysis
Forecasting Techniques
Highway Accident Analysis and Reconstruction
Industrial Safety and Hygiene
Industrial Hazard Identification and Safety Analysis
Japanese Methods for Productivity and Quality
Life Cycle Cost Analysis
Maintainability Engineering
Mathematical Theory of Reliability
Mechanical Reliability
Nonparametric Statistics
Nonlinear Programming
Operations Research
Probability Approach to Fatigue, Crack Growth, and Wear
Quantitative Methods for Management Decision Making
Quality Control Circles
Quality Control Engineering
Quantitative Methods for Criminal Justice Program Planning, Analysis, and Evaluation
Ranking and Selection Procedures
Reliability Testing
Reliability Engineering
Risk Analysis and Control Engineering
Statistical Methods in Reliability
Statistical Methods in Discrete Event Simulation
Stochastic Optimization
Systems Approach to Managing Hospital Risk
System Effectiveness
System Safety
Techniques of Time Series Analysis and Forecasting
Tools for the Data Analyst
Variance Components Estimation
Working Statistics

Management

Advanced Micrographics
Applied Statistical Theory
Applications of Forensic Sciences
Applied Forensics: Questioned Document Examination
Computer Systems for Warehousing/Distribution
Comparative Information Retrieval Systems
Concepts and Applications of Program Management
Contracting for Services
Configuration Management
Cost Estimating for Managers and Engineers
Data Base Management Essentials
Decision Making and Problem Solving
Developing and Managing Technical Training Programs
Evaluating and Selecting Automated Office Systems
Finance for Engineers
Information Systems Analysis
Information Resource Management
International Management and Marketing Strategy for Engineers and Scientists
Issues Management
Management of Project Documentation
Management of Programs and Projects
Management Skills for Engineers
Management by Objectives
Management Skills for Engineers and Scientists
Microcomputers in the Modern Office
Microfilm Information Systems
Project Management
Project Management and Beyond
Protection of Computer Assets

Public Policy Participation through Issues Management
Records Management
Records Management for Law Enforcement Organizations
Research and Development Management
Specifications and Construction Contracts
The Computer-Micrographics Interface: COM and CAR
Value Engineering/Analysis
Warehousing: Improved Efficiency through Automation

Materials/Structures/Construction

Advanced Topics in the Finite Element Method
Analysis and Control of Transportation Networks
Analysis and Prevention of Material Failure
Analysis and Design of Concrete Shell Structures
Computer-aided Preliminary Ship Design
Corrosion: Problem Solving
Creep Fracture in Solids
Critical Path Method
Designing for Earthquakes
Dynamic Design of Ocean Structures
Engineering Masonry Design and Construction
Fatigue and Fracture Reliability
Fibrous Composite Structures
The Finite Element Method and Computer Graphics
Fundamentals of Soils Engineering
Geotechnical Instrumentation
Heat Treating: Principles and Applications
Highway Bridges: Inspecting, Rating, and Upgrading
Imminent Revolution and Materials Technology
Increased Productivity Using Queuing Theory
Inelastic Pressure Vessels
Marine Vehicles: Seakeeping and Maneuverability
Metal Fracture and Fatigue
New Bridge Technology
Overflow Modeling and Analysis
Pavement Management: Design, Maintenance, and Rehabilitation
Probability Analysis and Risk/Geotechnical Engineering
Productivity Gains Through Material Handling Innovations
Quality Concrete Production and Construction Control
Railroad Crossties
Railroad Management for Higher Productivity
Railroad Signaling
Railway Bridges: Inspecting, Rating, and Upgrading
Recent Advances in Finite Element Technology
Recent Advances in Structural Models
Recent Developments in Prestressed Concrete Theory
Renovation of Railroad Track and Structures
Resistance and Propulsion of Ships
Roadbed Technology and Railway Track Renovation
Rock Engineering and Underground Construction
Structural Concrete Design
Structural Steel Design
Subsurface Exploration

Medical Engineering/Health Services

Advanced Medical Ultrasound Technology
Biomedical Equipment in Health Care Facilities
Biomedical Applications of Microwave Radiation
Clinical Biochemistry and Pathology
Clinical Engineering Management
Hospital Central Sterile Supply
Hospital Emergency Room Services
Inelastic Pressure Vessels
Intensive and Coronary Care Units
Medical and Hospital Control Systems
Neonatal Intensive Care

Outpatient and Day-surgery Center Services
Surgical Operating Suites

Energy

Advanced Pneumatic Control Systems Design
Advances in Solar Photovoltaics
Coal-fired Steam Generation
Cogeneration Systems: Design and Feasibility Analysis
Decision Analysis for Petroleum Exploration
Economics, Rates, and Regulation of Electrical Utilities
Electric Power System Design
Electrical Equipment Maintenance
Electrical Power System Design
Electrical Switchgear Controls and Protective Relaying
Electronic Controls for Industrial and Commercial Power Systems
Energy Forecasting
Energy Efficiency through Cogeneration
Energy Efficient Operation and Design of Buildings
Fluidized-bed Combustion
Forecasting Electricity Demand
Gas Well Testing and Underground Storage of Natural Gas
Grounding, Bonding, and Shielding/ Protection of Communications/ Electronics
Heat Pipe
Heavy Oil Recovery
Nuclear Energy: A Critical Review for the Nuclear Engineer
Oil Shale Development
Power System Protection
Power System Reliability
Protective Relaying and Switchgear Controls
Reservoir Engineering: Well Testing, Research, and Product Estimation
Solar Heating and Cooling
Spatial Load Forecasting and Power Systems Planning
Temperature Control Systems: Basics of Design
Temperature Control Systems: Calibration and Troubleshooting
Water Recycle and Reuse Systems

Environment

Aerospace Environment: C^{3}I* Perspectives
Air Pollution Control Equipment
Applied Oceanography
Design and Control of Turbine Generator Systems
Environmental Law
Environmental Assessment of Water Quality
Geological Hazards in Land Use Planning
Hazard Evaluation of Toxic Substances in Aquatic Ecosystems
Hazardous Wastes Management
Industrial Noise Control
Methodologies for Environmental Impact Studies
Operation and Management of Water Pollution Control Facilities
Preparation of Environmental Impact Statements
Process Design for Wastewater Treatment
Rights of Way and the Environment
Stack Sampling of Air Pollutants
Transportation in the 1980s
Understanding and Controlling Particulate Emissions
Wastewater Engineering
Water Quality Management

General Courses

Applied Geodesy
Effective Writing Workshop
Effective Written Communications
Finding New Products and Managing Their Development
Fixed Asset Analysis
Forensic Geology
Interpersonal Communications for Engineers and Managers
Oral Report Workshop
Packaging and Handling Systems: Engineering Design for Distribution
Report Writing Workshop

Patent Law for Engineers and Scientists
Technology Utilization
Techniques for Standards and Calibrations Laboratories
Technical and Economic Forecasting for Business and Government
Terrain Analysis
Tribiology
Urban Transportation Management
Utilization of the Space Shuttle
Writing Professional and Technical Communications

Communications

Advanced Radar Technology
Antennas
Basics of Military Communications
Cable Television: Technology, Policies, Economics
Command, Control, and Communications
Communications Satellite Engineering
Data Communications Systems and Networks
Data Communications for Managers
Digital Communications Systems
Digital Encoding and Processing of Voice and Video
Digital Signal Processing
Digital Telecommunications
Digital Telephony
Digital Transmission Systems Engineering
Electronic Mail: Technologies and Policy Issues
Electromagnetic Interference and Control
Federal Telecommunications Policy
Fiber Optic and Electro-Optic System Design
Fundamentals of Communications Satellite Systems
Grounding, Bonding, and Shielding
Hazardous Electromagnetic Radiation
Magnetic Recording
Modern Data Communications
Modern Microwave Techniques
Modern Telecommunications
Networks, Antennas, and Radiation
New Technology for the Use of Optics in Radar
Packet Switching
Phase Locked Loops
Protocols for Packet Switching
Radar Signal Processing
Radar Systems and Technology
Radiowave Propagation for Communication Systems Design
Radiowave Propagation in Satellite Communication Systems
Recent Advances and Current Trends in Data Communication
Satellite Communications Processing and Transmission
Satellite Systems for Navigation and Air Traffic Control
Selecting Organizational Telecommunications Systems
Sonar Signal Processing
Space Communications and Systems
Spread Spectrum Communication Systems
Switched Telephone Networks: Switching Concepts
Systems Design of Communications Satellites
Telecommunication Product Standards
Telecommunications: Voice and Data
Telephone Equipment Regulation for Voice/Data Interconnection
Telephone Interconnection Systems
Transmission Characteristics of Switched Telephone Networks
U.S. Telecommunications Policy: Implications
Vulnerability of Spread Spectrum Communication Systems
Wide Band Communications Systems

New courses are developed as needs become apparent in various fields, and repeated courses are continuously revised. Over 90 new courses were added last year.

In addition to the faculty of the School of Engineering and Applied Science, outstanding lecturers and instructors from other universities, from industry, and from government laboratories and agencies serve on the instructional staff of the program.

The program also offers noncredit contract courses off campus specifically tailored for the needs and background of the engineers employed by a company or agency. Tuition for these courses is usually slightly lower than for those offered at the University.

To receive announcements or additional information on the program, write to Continuing Engineering Education Program, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052, or call (202) 676-6106 or (800) 424-9773.

Administration

Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science; Co-director of the Joint Institute for Advancement of Flight Sciences; Director, Institute for the Study of Fatigue, Fracture, and Structural Reliability*

James Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*

Shao Wen Yuan, Ph.D., *Acting Chairman of the Department of Civil, Mechanical, and Environmental Engineering*

Donald Gross, Ph.D., *Chairman of the Department of Operations Research*

Arthur D. Friedman, Ph.D., *Chairman of the Department of Electrical Engineering and Computer Science*

Sam Rothman, Ph.D., *Chairman of the Department of Engineering Administration*

William H. Marlow, Ph.D., *Director, Institute for Management Science and Engineering*

Richard E. Merwin, Ph.D., *Acting Director, Institute for Information Science and Technology*

Vujica Yevjevich, D.Eng., *Director, International Water Resources Institute*

Frank Hohl, Ph.D., *Chief Scientist, NASA-Langley Research Center; Director of the Joint Institute for Advancement of Flight Sciences*

Malcolm P. Clark, M.S., *Administrator of the NASA-Langley Graduate Program*

John Lindsey Whitesides, Jr., Ph.D., *Assistant Director, Research and Education, Joint Institute for Advancement of Flight Sciences*

J.W. Perkins, B.S., *Director of the Continuing Engineering Education Program*

Graham W. McIntyre, M.S., *Director, Research and Resources Office*

William F. Shanahan, M.E.A., *Manager of Engineering Admissions and Cooperative Education Program*

DEAN'S COUNCIL

Harold Liebowitz *(Chairman)*, R.R. Fox, T.G. Toridis, Henry Steiner

Advisory Council*

The purposes of the Advisory Council for the School of Engineering and Applied Science are to strengthen communication between the School and the other colleges, schools, and divisions of the University as well as between the School and the University's Board of Trustees; to advise on the programs of instruction, research, and service in the School and to help interpret these programs to the community and the nation; and to stimulate support for the continued development of the School and its programs.

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L.A. Zadeh, *Chairman, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley*

*The President of the University, the Vice President for Academic Affairs, and the Dean of the School of Engineering and Applied Science are *ex officio* members of the Advisory Council.

PROGRAMS OF STUDY AND COURSES OF INSTRUCTION

On the following pages are listed programs of study, curricula, and courses of instruction offered by the School of Engineering and Applied Science.

Students who are not candidates for degrees but who wish to take courses offered by the School should apply for admission to the Division of University Students.

EXPLANATION OF COURSE NUMBERS

Courses numbered from 1 through 199 are planned for undergraduate credit, although certain courses may be taken for graduate credit when arrangements are approved in advance by the instructor and the Dean. Courses numbered 201 to 300 are planned for graduate credit and may in certain instances be taken by qualified undergraduate students. Courses numbered from 301 to 400 are primarily for doctoral students.

SEMESTER HOURS OF CREDIT

The number of semester hours' credit given for the satisfactory completion of a course is indicated in parentheses after the name of the course. Thus, a year course giving three hours of credit each semester is marked (3–3), and a semester course giving three hours' credit is marked (3). A semester hour consists of the completion of one 50-minute period of class work or of one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following each course description is a parenthetical statement listing the semester for which the course is scheduled to be offered. The term "academic year" is used only with two-semester courses, and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester; the term "as arranged" is used for courses which could not be scheduled at the time of printing this catalogue. Offerings for the summer sessions are not designated in this catalogue. Students should consult the *Summer Sessions Schedule of Classes* for summer offerings. A *Schedule of Classes* is also published for each fall and spring semester which provides up-to-date information concerning the time of course offerings.

KEY TO ABBREVIATIONS

The following abbreviations for course designations are used by George Washington University.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCS	Health Care Sciences
HSA	Health Services Administration
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opth	Ophthalmology
Oral	Oral Biology
Orth	Orthopedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
RSci	Radiological Sciences
Rad	Radiology
RPol	Regulatory Policy
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
Univ	University
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

Applied Science

Interdepartmental offerings.

UNDERGRADUATE COURSES

57 Analytical Mechanics I (2)

First half of a one-year sequence. Concepts of statics, including force systems, equilibrium conditions, simple structures, distributed forces, shear and moments, friction and the concept of work, virtual work and stability. Prerequisite or concurrent registration: ApSc 113, Phys 14. (Fall and spring)

58 Analytical Mechanics II (3)

Second half of a one-year sequence. Concepts of dynamics, including kinematics of particles, velocity and acceleration, Newton's laws of motion, momentum, work, kinetic energy, potential energy, central force fields, vibrations, resonance, dynamics of systems of particles, kinematics of a rigid body, dynamics of a rigid body. Prerequisite: ApSc 57. (Fall and spring)

113 Engineering Analysis I (3)

Analytical methods appropriate to the solution of engineering problems, including applications of ordinary differential equations, matrices and determinants, eigenvalues and eigenvectors, systems of ordinary linear differential equations, Bessel and Legendre functions. Prerequisite: Math 33. (Fall and spring)

114 Engineering Analysis II (3)

Analytical methods appropriate to the solution of engineering problems, including complex variables, Fourier series and integral, orthogonal functions, Laplace transforms, partial differential equations in engineering and applied science. Prerequisite: ApSc 113. (Fall and spring)

115 Engineering Analysis III (3)

Solution of engineering problems using concepts from probability and statistics, including random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, and regression. This methodology applied to problems of structural design, bioengineering, manufacturing processes, product quality, equipment reliability, engineering management, and societal engineering. Prerequisite: Math 31. (Fall and spring)

116 Engineering Analysis IV (3)

Solution of engineering problems using advanced concepts from probability and statistics applied to problems of engineering design, bioengineering, production processes, engineering management, and societal engineering. Prerequisite: ApSc 115 and Math 33. (Fall and spring)

199 Honors Research Project and Seminar (3)

The student designs and carries out a research project under the close supervision of a faculty adviser. Students from all engineering disciplines meet periodically in a seminar to present their projects and discuss results with their peers. Enrollment is limited to those students admitted to the SEAS Undergraduate Honors Research Program.

GRADUATE COURSES

211 Analytical Methods in Engineering I (3)

Engineering applications of the theory of complex variables including contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of Department. (Fall and spring)

212 Analytical Methods in Engineering II (3)

Analytical methods appropriate to the formulation of engineering problems including finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of Department. (Fall)

213 Analytical Methods in Engineering III (3)

Analytical techniques for solution of boundary-initial value problems in engineering involving wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of Department. (Fall and spring)

214 Analytical Methods in Engineering IV (3)

Introduction to variational methods in engineering including Ritz and Galerkin approximation methods of boundary-value problems. Aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of Department. (Spring)

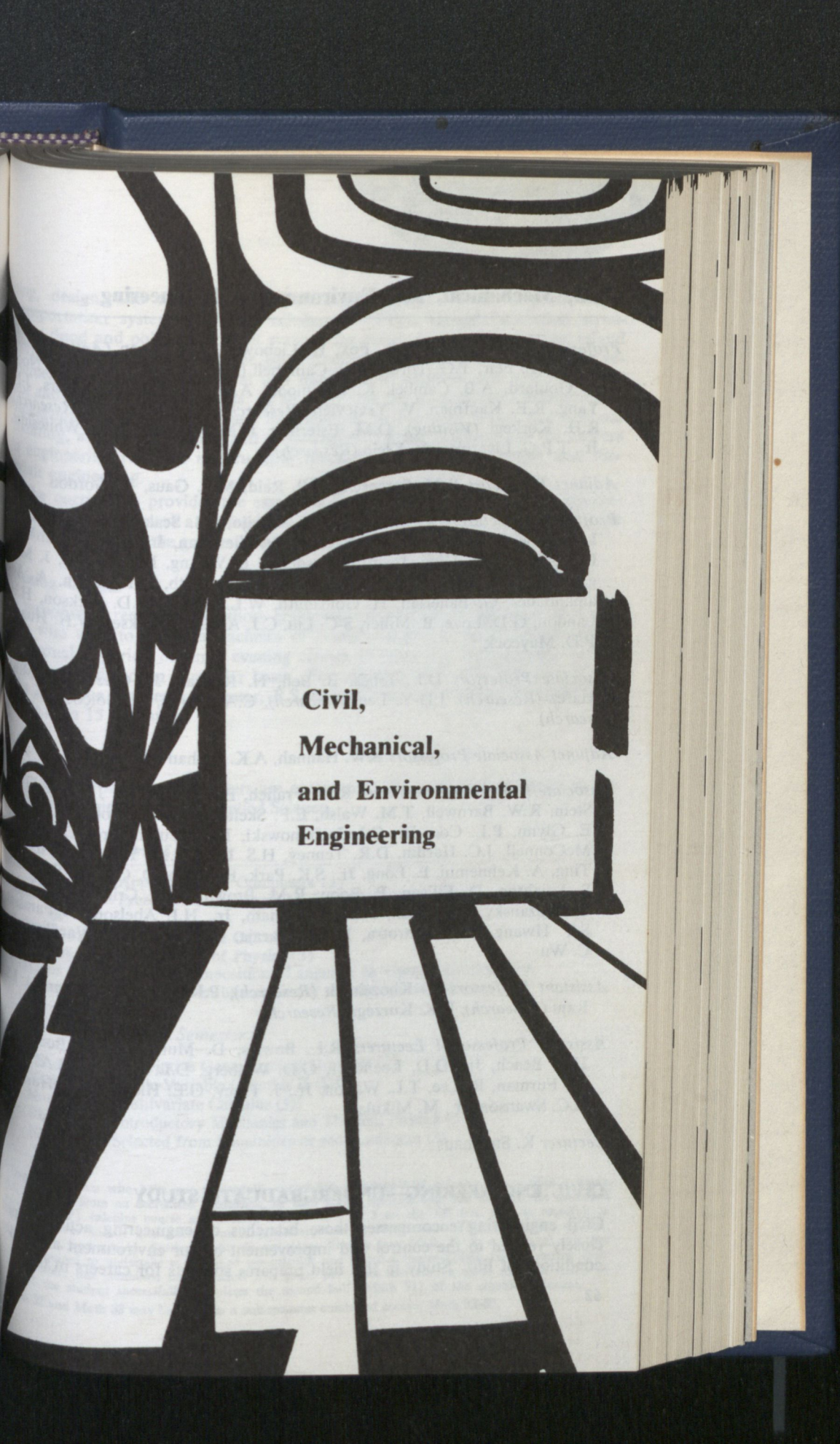
215 Analytical Methods in Engineering V (3)

Advanced methods of solution of boundary-initial value problems in engineering, including characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall)

216 Special Topics in Engineering Analysis (3)

Selected topics such as (1) perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering; (2) application of singular integral equations in problems of mechanics; (3) applications of elements of functional analysis in engineering and science. Prerequisite: approval of Department. (Spring, even years)

KOUROS


Civil,
Mechanical,
and Environmental
Engineering

Civil, Mechanical, and Environmental Engineering

Professors G.M. Arkilic, R.R. Fox, H. Liebowitz, S.W. Yuan *(Acting Chairman)*, J.E. Feir, T.G. Toridis, J.P. Campbell *(Research)*, J. Eftis, A.K. Noor, R. Goulard, A.B. Cambel, K. Mahmood, A.M. Kiper, M.K. Myers, J-N. Yang, R.E. Kaufman, V. Yevjevich *(Research)*, A. Radkowsky *(Research)*, R.H. Korkegi *(Visiting)*, D.M. Esterling, C.M. Gilmore, J.L. Whitesides, Jr., T.P.G. Liverman, V. Klein *(Research)*

Adjunct Professors R.M. Sorensen, W.P. Reid, M.P. Gaus, Y. Gordon

Professorial Lecturers R.E. Fulton, M.J. Queijo, J.B. Scalzi, L.K. Loftin, Jr., L. Divone, L.G. Herman, M. Yachnis, W. Viessman, Jr., K.H. Jones, W.D. Erickson, J.A. Belding, Jr., N.L. Basdekas, B. Whang, M.S. Ojalvo, J. Morgan, Jr., J. Weggel, T-F. Zien, D. Michel, A. Kotb, D.R. Levin, A. Adamantiades, G. Banerian, H. Goldsmith, W.L. Harris, W.D. Jackson, H.H. Landon, G.D. Love, B. Miller, S-C. Liu, C.J. Astill, S. Buckser, W.H. Huang, P.D. Maycock

Associate Professors D.L. Jones, B. Bell, H. Runyan, Jr. *(Research)*, M.M. Hafez *(Research)*, J.D-Y. Lee *(Research)*, C.A. Garris, A. Goicoechea *(Research)*

Adjunct Associate Professors B.W. Hannah, A.K. Trehan

Associate Professorial Lecturers R.W. Fralich, E.C. Yates, Jr., J. Sobieski, M. Stein, R.W. Barnwell, T.M. Walsh, E.F. Skelton, H.A. Leybold, J. Ettinger, E. Glynn, P.L. Coe, Jr., C.J. Jachimowski, M.C. Cullingford, D. Feit, R. McConnell, J.C. Hardin, D.R. Tenney, H.S. Lew, A.M. Yen, J.C. Yu, R.Y. Ting, A. Kehnemui, E. Long, Jr., S.K. Park, H. Singh, D. Gubser, W. Kenis, S. Leighton, D. Ellison, P. Boon, R.M. Brown, M.O. Critchfield, C. Ng, M. Rozansky, B.P. Shah, F.L. Willingham, Jr., H.I. Abelson, F. Farassat, S.T. Hwang, S.C. Mehrotra, M.S. Nataraja, L-S. Pan, A.B. Wardlaw, Jr., C. Wu

Assistant Professors K. Khozeimeh *(Research)*, P.K. Poulose *(Research)*, I.S. Raju *(Research)*, R.K. Kurzega *(Research)*

Assistant Professorial Lecturers R.L. Bowles, D. Mulville, W.J. Boettinger, H.L. Beach, Jr., D.D. Loendorf, G.D. Walberg, D.L. Dwoyer, B.A. Stein, M. Furman, R. Lee, T.L. Walton, Jr., J. Tracy, G.E. Hicho, M.Y. Hussaini, R.C. Swanson, Jr., M. Mikulas

Lecturer K. Steinhaus

CIVIL ENGINEERING—UNDERGRADUATE STUDY

Civil engineering encompasses those branches of engineering activities most closely related to the control and improvement of our environment and of the conditions of life. Study in this field prepares students for careers in the plan-

ning, design, and construction of buildings; bridges; roads; airports; rapid transportation systems; harbors; off-shore facilities; coastal protection structures; flood and pollution control systems for rivers, estuaries, and lakes; inland navigation systems; large power generation and flood control dams; water resources projects; urban renewal and development projects; and pollution control and waste disposal projects. It also provides the scientific and technological background required for careers in municipal engineering, urban and regional planning, and environmental and geotechnical civil engineering; and for careers in engineering research in structural mechanics, ocean engineering, and materials engineering.

The curriculum provides the essentials for beginning a career upon graduation, for registration as a professional civil engineer as required by law, and for continuing study at the graduate level.

Evening Classes

In response to requests from those employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Civil Engineering in a reasonable period of time, evening classes in the Civil Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
Math 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	Single-Variable Calculus II (3)†
Math 33:	Multivariate Calculus (3)†
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

*Transfer students who have not successfully completed a college-level calculus course with a grade of C or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

†Math 32 and Math 33 may be taken in a one-semester combined course, Math 32–33.

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
ApSc 115:	Engineering Analysis III (3)
Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Fourth Semester

ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 120:	Introduction to Mechanics of Solids (3)
CE 140:	Materials Science (3)
Phys 16:	Introduction to Modern Physics (3)

Civil Engineering Curriculum

Fifth Semester

CE 110:	Introduction to Environmental Engineering (3)
CE 121:	Structural Theory I (3)
CE 166:	Materials Engineering (2)
CE 167:	Mechanics of Materials Laboratory (1)
ME 131:	Thermodynamics (3)
Elective:	Selected from humanities or social sciences (6)

Sixth Semester

CE 122:	Structural Theory II (3)
CE 190:	Legal and Economic Aspects of Engineering (2)
CE 192:	Reinforced Concrete Structures (3)
Geol 136:	Engineering Geology (3)
ME 126:	Fluid Mechanics (3)
Elective:	Selected from humanities or social sciences (3)

Seventh Semester

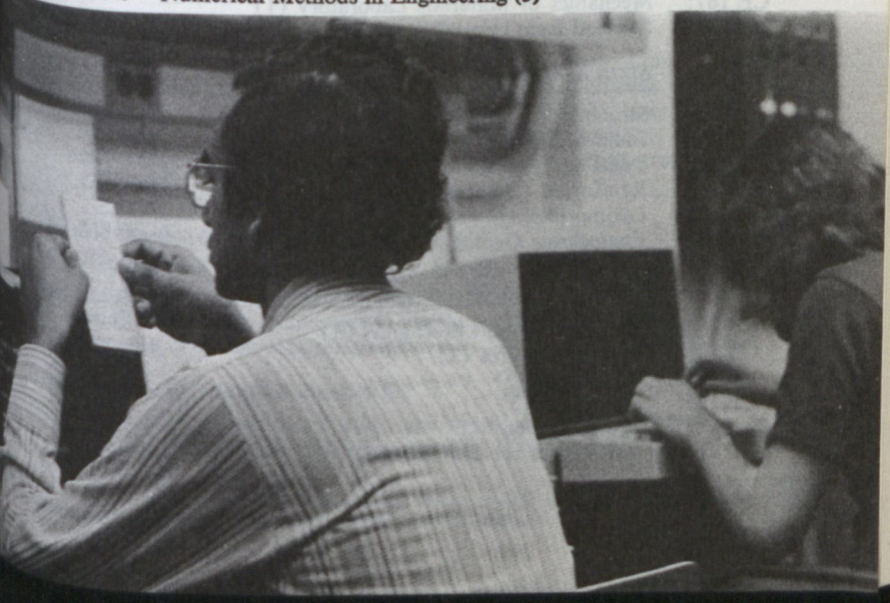
CE 168:	Introductory Soil Mechanics (3)
CE 191:	Metal Structures (3)
CE 193:	Hydraulics (3)
CE 194:	Environmental Engineering I: Water Supply and Resources (3)
CE 195:	Hydrology (3)
Elective:	Technical electives (3)

Eighth Semester

CE 182:	Foundation Engineering (2)
CE 185:	Soil Mechanics and Foundation Engineering Laboratory (1)
CE 196:	Design and Cost Analysis of Civil Engineering Structures (3)
CE 197:	Environmental Engineering II: Waste and Pollution Control (3)
Elective:	Technical electives (5)

Technical Electives

CE 198: Research (3)
CE 201: Design of Metal Structures (3)
CE 202: Design of Reinforced Concrete Structures (3)
CE 203: Prestressed Concrete Structures (3)
CE 204: Applied Soil Mechanics I (3)
CE 206: Foundation Engineering (3)
CE 208: Rock Mechanics (3)
CE 210: Methods of Structural Analysis (3)
CE 212: Open Channel Flow (3)
CE 213: Hydraulic Structures (3)
CE 214: Design of Dams (3)
CE 215: Urban Construction Technology (3)
CE 216: Advanced Hydrology (3)
CE 220: Urban Transportation Engineering (3)
CE 222: Stations and Terminals (3)
CE 223: Traffic Engineering (3)
CE 240: Environmental Microbiology (3)
CE 241: Environmental Chemistry (3)
CE 243: Environmental Impact Assessment (3)
CE 253: Failure and Reliability Analysis of Engineering Structures (3)
CE 255: Coastal Processes (3)
CE 266: Design Procedures for Earthquakes (3)
CE 282: Hydraulic Modeling (3)
EAd 150: Introduction to Engineering Administration (3)
EngS 215: Advanced Strength of Materials (3)
EngS 229: Transformations in Materials (3)
EngS 230: Deformation of Materials (3)
EngS 231: Structure of Materials (3)
EngS 234: Composite Materials (3)
EngS 237: Environmental Effects on Materials (3)
EngS 241: Failure of Materials (3)
EngS 242: Materials Recycling and Recovery (3)
EngS 282: Computer-aided Design (3)
EngS 284: Numerical Methods in Engineering (3)



Geotechnical Civil Engineering Option

Geotechnical civil engineering encompasses engineering problems involving soil mechanics, foundation engineering, rock mechanics, and geological aspects of engineering. More specifically, planning, designing, and erecting structures founded on or made of soil and rock constitute the main features of this branch of civil engineering. Included are the design and construction of foundations for all types of buildings, bridges, and highway and airfield pavements; design and construction of earth- and rock-fill dams, embankments, waterfront structures, tunnels, and drainage facilities; and stabilization procedures for reclamation of marginal lands. Engineering geology, which is the application of geological data, principles, and interpretations to naturally occurring earth and rock masses, constitutes an important part in the planning and design stages of civil engineering structures of the above type. The Geotechnical Civil Engineering Option provides the student with the fundamentals for subsequent growth and development in this branch of civil engineering.

CURRICULUM

Prerequisite: first four semesters as described in the Core Curriculum, see pages 63–64 with the following changes:

Third semester: *Geology 21 *Physical and Evolutionary Geology* will be taken instead of the elective.

Fourth semester: *Geology 122 *Structural Geology* will be taken instead of CE 120: *Introduction to the Mechanics of Solids.* A 3-credit elective in the social sciences or humanities should also be taken at this time.

	Fifth Semester
CE 120:	Introduction to the Mechanics of Solids (3)
CE 121:	Structural Theory I (3)
ME 131:	Thermodynamics (3)
CE 166:	Materials Engineering (2)
CE 167:	Mechanics of Materials Laboratory (1)
Elective:	Selected from humanities or social sciences (3)

	Sixth Semester
CE 122:	Structural Theory II (3)
ME 126:	Fluid Mechanics (3)
CE 190:	Legal and Economic Aspects of Engineering (2)
CE 192:	Reinforced Concrete Structures (3)
*Geol 128:	Geomorphology (3)
*Geol 136:	Engineering Geology (3)

	Seventh Semester
CE 168:	Introductory Soil Mechanics (3)
CE 191:	Metal Structures (3)
CE 193:	Hydraulics (3)
CE 195:	Hydrology (3)
*Geol 163:	Sedimentation (4)
*Geol 189:	Geophysics for Geologists (3)

* For course descriptions, see the *Undergraduate and Graduate Bulletin.*

Eighth Semester

CE 182: Foundation Engineering (2)
CE 185: Soil Mechanics and Foundation Engineering Laboratory (1)
CE 204: Applied Soil Mechanics I (3)
*Geol 195: Field Work (2)
Electives: Selected from humanities or social sciences (6)

Civil Engineering Undergraduate Courses

110 Introduction to Environmental Engineering (3)

An introductory study of environmental resources and their uses. Aspects considered will include water resource systems; air and water quality; solid waste and wastewater disposal systems; noise pollution; treatment processes; environmental impact analysis and environmental planning. Prerequisite: Chem 13. (Fall)

120 Introduction to the Mechanics of Solids (3)

Three-dimensional strain and stress. Constitutive equations for elastic, viscoelastic, and plastic materials. Axial load, bending and torsion of struts and beams. Instability and failure. Prerequisite: ApSc 57, 113. (Fall and spring)

121–22 Structural Theory I-II (3–3)

Theory of determinate and indeterminate structures using both classical and modern approaches. Prerequisite or concurrent registration: CE 120. (Fall and spring)

140 Materials Science (3)

Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; transport phenomena—thermal conductivity, electrical conduction; metals, insulators, semiconductors; magnetism. Prerequisite: Chem 13; concurrent registration: Phys 16. (Fall and spring)

166 Materials Engineering (2)

Mechanical properties and their description; effect of microstructure on the mechanical behavior of metals, ceramics, polymers, and polyphase materials; effect of strain-rate and temperature; creep, fatigue, and fracture; effect of surface and environment; materials evaluation for structural performance. Prerequisite: CE 140; concurrent registration: CE 120. (Fall and spring)

167 Mechanics of Materials Laboratory (1)

Measurement of strains and study of failure resulting from applied forces in ductile, brittle, anisotropic, elastomeric, plastic, and composite materials. Study of tension, compression, bending, impact and shear failures. Prerequisite or concurrent registration: CE 166. (Fall and spring)

168 Introductory Soil Mechanics (3)

Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)

*For course descriptions, see the *Undergraduate and Graduate Bulletin*.

182 Foundation Engineering (2)

Subsurface exploration, design of shallow foundations, design of pile foundations, earth-retaining structures. Prerequisite: CE 168. (Spring)

185 Soil Mechanics and Foundation Engineering Laboratory (1)

Laboratory experiments for the classification, strength, compressibility, and general engineering properties of soils. Prerequisite: CE 168. (Spring)

190 Legal and Economic Aspects of Engineering (2)

Laws relating to engineering practice, preparation of contract documents and specifications, consideration of economic factors in engineering design decisions. (Spring)

191 Metal Structures (3)

Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction. Prerequisite: CE 122. (Fall)

192 Reinforced Concrete Structures (3)

Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 121. (Spring)

193 Hydraulics (3)

Fluid statics: applications to calculation of boundary forces in a static fluid, buoyancy, and flotation. Application of kinematic principles; flow fields, stream tubes, and flow nets. Fluid dynamics: applications to pipe flow, hydraulic models, measurement of pressure, and velocity. Open channel flow: applications to water resources engineering. Prerequisite: ME 126. (Fall)

194 Environmental Engineering I: Water Supply and Resources (3)

Planning and design of water supply and waste-water disposal systems. Water quality control and treatment processes. Desalination, stream pollution control. Prerequisite or concurrent registration: CE 193. (Fall)

195 Hydrology (3)

Descriptive hydrology: hydrologic cycle, precipitation, stream flow, evaporation, and transpiration. Quantitative hydrology: hydrograph analysis, estimating volume of runoff, runoff from snow, hydrographs of basin outflow, storage routing. Probability concepts in hydrology: flood frequency, rainfall frequency, drought, stochastic hydrology. Prerequisite or concurrent registration: ApSc 115, ME 126, CE 193. (Fall)

196 Design and Cost Analysis of Civil Engineering Structures (3)

Design of civil engineering structures such as wharves, piers, bulkheads, tunnels, dams, bridges, water treatment, and drainage systems. Prerequisite: senior status. (Spring)

197 Environmental Engineering II: Waste and Pollution Control (3)

Disposal of sewage, biological treatment, chemical treatment, filtration, activated sludge, sludge handling and disposal. Control of industrial wastes and of nuclear waste products. Solid waste disposal. Prerequisite: CE 193. (Spring)

198 **Research** (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

MECHANICAL ENGINEERING—UNDERGRADUATE STUDY

Mechanical engineering is primarily concerned with physical systems in motion. A mechanical engineer is concerned with the conversion, transfer, and control of energy from its source to its moving system. Land and marine vehicles, transportation systems, air-conditioning systems, nuclear reactors and fuel cells, low-pollution control devices, synthetic fuels, energy resources and the means of practical and economical conversion of the various forms of energy to mechanical and electrical power, and a host of other devices lie in this domain. Training in this area should provide the ability to formulate problems based on fundamental laws of nature, to recognize the types of methods which are applicable to their solution, to read with understanding the revelant work, and to come up with a usable answer. The mechanical engineering curriculum provides a background for careers in research, design, development, and manufacture in a wide variety of industries.

Course offerings in mechanical engineering, which begin with a broad foundation in physics, chemistry, mathematics, humanities, and social sciences, consist of studies in basic mechanics of solids and fluids, electricity and electronics, material sciences, dynamic analysis, thermal sciences, energy conversion and power, environmental control, and the design of machines and systems and their control. Technical electives in the senior year allow students interested in computers to select an option which will prepare them for careers in computing as well as graduate study in computer-dominated or computer-oriented professional fields. The program outlined below is based on the concept that the mechanical engineer must be prepared to meet the challenge of ever-increasing technical, economic, and social problems.

Graduates are qualified for professional positions in design, analysis, manufacture, and application of machines, process, and control, or in research and development, as well as for graduate work.

Evening Classes

In response to requests from those employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Mechanical Engineering in a reasonable period of time, evening classes in the Mechanical Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Junior Year Abroad Program

The School of Engineering and Applied Science and the Institute of Sound and Vibration Research of the University of Southampton, England, have established an exchange program so that graduate students in acoustics at both institutions may transfer academic credits to either University in fulfillment of the

requirements for advanced degrees. A special arrangement has now been made to extend the graduate exchange program to the undergraduate level, enabling some mechanical engineering students to spend the junior year abroad.

The program furthers a student's particular academic interests in mechanical engineering and develops knowledge of world affairs in general, and international technical fields in particular.

Applicants must apply for admission to the Junior Year Abroad program to the Department Chairman before the end of the fall semester of the sophomore year. Approval must be given by the Department Chairman and the Dean of the School of Engineering and Applied Science.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
Math 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	Single-Variable Calculus II (3)†
Math 33:	Multivariate Calculus (3)†
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
ApSc 115:	Engineering Analysis III (3)
Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Fourth Semester

ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 140:	Materials Science (3)
EE 11:	Linear Networks I (3)

* Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

† Math 32 and Math 33 may be taken in a one-semester combined course, Math 32–33.

Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3)
(May be taken during the Summer Sessions)

Mechanical Engineering Curriculum

Fifth Semester

CE 120: Introduction to the Mechanics of Solids (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 131: Thermodynamics (3)
ME 134: Introduction to Vibration Analysis (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

EE 20: Introductory Engineering Electronics (3)
EE 172: Control Systems (3)
ME 120: Methods of Engineering Experimentation (2)
ME 126: Fluid Mechanics (3)
ME 148: Thermodynamic Analysis (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

ME 155: Compressible Fluid Flow (3)
ME 187: Heat Transfer Theory (3)
ME 190: Mechanisms, Analysis, and Synthesis (3)
ME 191: Mechanical Design (3)
Elective: Technical electives (6)

Eighth Semester

ME 152: Mechanical Engineering Laboratory (2)
ME 193: Engineering Systems Design (3)
ME 194: Energy Conversion (3)
Elective: Technical electives (6)

Technical Electives

CE 197: Environmental Engineering II: Waste and Pollution Control (3)
EAd 150: Introduction to Engineering Administration (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
EngS 215: Advanced Strength of Materials (3)
EngS 229: Transformations in Materials (3)
EngS 230: Deformation of Materials (3)
EngS 231: Structure of Materials (3)
EngS 237: Environmental Effects on Materials (3)
EngS 241: Failure of Materials (3)
*ME 176: Environmental Engineering Problems (3)
ME 192: Product Design and Process Engineering (3)
ME 215: Theory of Vibrations (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 225: Turbomachinery I (3)
ME 237: Propulsion I (3)
ME 240: Kinematic Synthesis (3)
ME 247: Fluidics (3)

*Required course which must be selected from the technical electives.

Technical Electives for Computer-oriented Mechanical Engineering Option

CSci 278: Analog and Hybrid Computers (3)
EE 152: Introduction to Digital Computers (3)
EE 157: Machine and Assembly Language Programming (3)
EngS 282: Computer-aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
*ME 176: Environmental Engineering Problems (3)

Technical Electives for Energy Resources and Power-oriented Mechanical Engineering Option

EE 177: Electrical Energy Conversion (3)
EngS 208: Energy Conservation (3)
EngS 214: Geothermal Energy (3)
*ME 176: Environmental Engineering Problems (3)
ME 224: Fundamentals of Combustion Engines (3)
ME 225: Turbomachinery I (3)
ME 237: Propulsion I (3)
ME 259: Solar Heating and Cooling of Buildings (3)
ME 260: Heating and Air Conditioning of Buildings (3)
ME 283: Nuclear Reactor Engineering I (3)
ME 294: Wind Energy (3)

Mechanical Engineering Undergraduate Courses

120 Methods of Engineering Experimentation (2)
Acquisition and analysis of experimental data. Laws of modeling and simulation. Report formulation and presentation. Basic principles of various measuring instruments and sensors. Laboratory experiments, including use of strain gages, oscilloscopes, various tranducers, etc. Introduction to basic experimental techniques related to dynamics, fluid flow, and thermal sciences. Prerequisite: CE 120, ME 131. (Spring)

126 Fluid Mechanics (3)
Fluid properties, regimes in fluid mechanics, fluid statics, fluid kinematics, basic equations, one- and two-dimensional inviscid incompressible flow, viscous incompressible flow, dimensional method. Prerequisite: ApSc 58. (Spring)

131 Thermodynamics (3)
Fundamental thermodynamic concepts, Zeroth law of thermodynamics and temperature measurements, work and heat, first law of thermodynamics, properties of pure substances, first-law analysis of some thermodynamic systems, second law of thermodynamics, reversibility, entropy, second-law analysis of thermodynamic systems. Prerequisite or concurrent registration: ApSc 58. (Fall)

134 Introduction to Vibration Analysis (3)
Natural frequencies and response of single- and multiple-degree of freedom mechanical systems to dynamic loads. Effect of damping, transient and steady-state analysis. Prerequisite: ApSc 58. (Fall)

* Required course which must be selected from the technical electives.

148 Thermodynamic Analysis (3)

Analysis of thermodynamic power and refrigeration cycles; thermodynamics of mixtures of substances; properties of air-water vapor mixtures; psychrometry and analysis of cooling tower and air-conditioning plant; third law of thermodynamics and absolute entropy; evaluation of combustion processes. Molecular distributions and models; introduction to statistical and quantum mechanics; statistical thermodynamics and thermodynamic properties of gases and solids. Prerequisite: ME 131. (Spring)

152 Mechanical Engineering Laboratory (2)

Experimental study of various engineering systems. Laboratory projects include experimental design, modeling and simulation parameters, data acquisition, and report presentation techniques. Prerequisite: ME 120. (As arranged)

155 Compressible Fluid Flow (3)

Introduction to compressible flow, basic equations, propagation of motion in compressible fluids, isotropic-flow relations, steady one-dimensional flow, wave phenomena, small perturbation theory, slender-body theory, method of characteristics. Prerequisite: ME 126, 131. (Fall)

176 Environmental Engineering Problems (3)

Atmospheric pollutants: Current levels and health problems. Combustion chemistry and mixing. Application to automobile and power plant controls. Photochemical processes: Smog and measurements. Atmospheric dispersion: Inversion and acid rain. Prerequisite: ME 131. (Fall)

187 Heat Transfer Theory (3)

Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective-heat transfer. Evaluation of convective-heat transfer coefficients; dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative-heat transfer between surfaces. Design considerations; heat-exchanger design and selection. Prerequisite: ME 126. (Fall)

190 Mechanisms, Analysis, and Synthesis (3)

Kinematics and dynamics of mechanisms. Displacement, velocities, accelerations in linkage and cam systems by analytical and graphical methods. Prerequisite: ApSc 58. (Fall)

191 Mechanical Design (3)

Introduction to design concept, selection of materials, and strength of mechanical elements; design of machine components such as shafts, springs, bearings, gears, couplings, screws, and related mechanical components. Prerequisite: senior status. (Fall)

192 Product Design and Process Engineering (3)

Introduction to product design and to modern manufacturing techniques. Functional, technological, and economic considerations, such as production volume, energy and materials consumption, and labor. Criteria for product acceptance, cost, and other factors. Properties and behavior of metals and polymers. Capabilities and limitations of various basic and secondary processes and their influence on product design. Prerequisite: senior status. (Spring)

193 Engineering Systems Design (3)

Creative engineering design, problem definition, and concept generation. Familiarization with standard machine components. Practice in integrating a variety of core disciplines via system design projects. Visual thinking, graphical communication, analysis and optimization techniques. Creative solutions to current, real engineering design problems. Design projects may integrate with ME 152 Mechanical Engineering Laboratory projects. Prerequisite: ME 191. (Spring)

194 Energy Conversion (3)

Energy resources of the earth; energy, society, and the national economy; issue of energy and the environment, future outlook for energy supply and demand. Conversion of energy; fundamental principles and technological options, efficiency of different energy converters. Current technologies and longer-range possibilities. Generation of electricity, trends in the electricity industry; nuclear power systems—growth, economic, and environmental impacts. Unconventional methods of power generation; direct energy conversion. Prerequisite: EE 20, ME 148. (Spring)

198 Research (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

ENGINEERING SCIENCE—UNDERGRADUATE COURSE

4 Descriptive Geometry and Drafting (3)

Introductory descriptive geometry. Use of equipment. Points, lines, curves, planes, and surfaces; principal, auxiliary, and orthographic views; isometric views, intersection of surfaces. Technical sketching, dimensions and precision, machine elements. Detail and assembly drawings. Structural elements. Layout and fabrication drawings, pipe and electric prints. (Spring)

GRADUATE STUDY

Developments in science and technology in the decades to come require that the engineer be thoroughly grounded in fundamentals as well as in the newly emerging technological and scientific disciplines. The modern engineer must also master techniques in analysis, computation, design, and synthesis. Amidst the proliferation of knowledge and technological specialty, the Department adheres to the principle that versatility and depth in scientific fundamentals should be the characteristic features of any graduate program that attempts to prepare the student to cope with engineering developments.

The Department of Civil, Mechanical, and Environmental Engineering offers graduate programs in the various areas of concentration on three degree levels: the Master of Science degree, the Professional degree, and the Doctor of Science degree.

The Doctor of Science degree is offered in the following areas: acoustics; aeronautics; energy; environmental engineering; fluid mechanics and thermal sciences; ocean, coastal, and marine engineering; solid mechanics and materials engineering; structural engineering; structures and dynamics; transportation engineering (except Option III which is for the M.S. and Professional degrees

only); and water resources (except Option II, water resources planning, which is for the M.S. degree only).

The Master of Science and the Professional degrees are offered in all of the aforementioned areas and in the following areas: computer-aided design, environmental modeling, geotechnical engineering, mechanical engineering design, and public works engineering.

Courses for these specializations are listed on subsequent pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science, as well as from other schools and divisions of the University. Depending upon the interest of the student, some of the programs leading to the degrees of Master of Science and, by special permission of the appropriate department chairman, Doctor of Science degrees are given at the NASA-Langley Research Center, Hampton, Va. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized whenever feasible.

Each program is arranged to fit the student's individual needs and interests and utilize previous experience and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests, enabling a close student-faculty relationship to develop during the course of the program.

Fields and Areas of Concentration

Programs of study in any field of concentration will generally include courses from appropriate allied areas.

ACOUSTICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
*EngS 203–4: Probability and Statistics of Metrology
EngS 217: Analytical Mechanics
EngS 270: Theoretical Acoustics I
*EngS 271: Random Process Theory I
*EngS 272: Random Process Theory II
*EngS 273: Time Series Analysis
EngS 274: Environmental Noise Control
*EngS 275: Theoretical Acoustics II
*EngS 276: Acoustical and Mechanical Measurements
*EngS 277: Physical Acoustics
*EngS 278: Psychological and Physiological Acoustics
*EngS 279: Human Factors in Engineering
*EngS 280: Special Topics in Acoustics
EngS 298: Research
EngS 299–300: Thesis Research
*EngS 310: Aeroacoustics
*EngS 311: Nonlinear Acoustics
*EngS 312: Theory of Random Vibration
*EngS 313: Structural Acoustics Interaction

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 312: Theory of Turbulence

AERONAUTICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
EE 202: Linear System Theory I
EngS 217: Analytical Mechanics
EngS 284: Numerical Methods in Engineering
ME 215: Theory of Vibrations
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 223: Aeroelasticity
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
*ME 248: Seminar: Aircraft Design I
*ME 249: Seminar: Aircraft Design II
*ME 270: Applied Fluid Dynamics
*ME 271: VTOL Aircraft Technology
*ME 272: Powered-lift Technology
*ME 273: Principles of Automatic Flight Control
*ME 274: Principles of Flight Guidance
ME 275: Stability and Control of Vehicles
*ME 277: Numerical Methods in Fluid Mechanics
*ME 278: Performance, Stability, and Control of Helicopters
*ME 279: Special Topics in Flight Sciences
ME 281: Nonequilibrium Thermodynamics
*ME 290: Kinetic Theory of Gases
ME 295: Statistical Thermodynamics
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 315: Hypersonic Flow
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for MS Degree: ApSc 211, 213, ME 221, and 275.

COMPUTER-AIDED DESIGN

ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 210: Methods of Structural Analysis
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

CE 252: General Structural Dynamics
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 262: Design of Plate and Shell Structures
CE 263: Theory of Structural Stability
CSci 158: Algorithmic Methods and High-level Languages
CSci 201: Introduction to Computer Systems
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 219: Interactive Computer Graphics
CSci 227: Management Information Systems and Data Base Management
EngS 251–52: Transportation Workshop
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 240: Kinematic Synthesis
ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 247: Fluidics
ME 251: Advanced Electromechanical Control Systems

Required courses for MS Degree: ApSc 213, CSci 201, 213, 214, EngS 282, and CSci 219 or EngS 283.

ENERGY

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
CE 243: Environmental Impact Assessment
EAd 221–22: Environmental Management
EAd 283: Systems Engineering I
EngS 206: Technology and Human Needs
EngS 207: Engineering Climatology
EngS 208: Energy Conservation
EngS 210: Quantitative Aspects of Social Phenomena
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 214: Geothermal Energy
EngS 242: Materials Recycling and Recovery
EngS 270: Theoretical Acoustics I
EngS 274: Environmental Noise Control
EngS 284: Numerical Methods in Engineering
ME 204: Advanced Instrumentation Techniques
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engines
ME 225: Turbomachinery I

ME 226:	Turbomachinery II
ME 227:	Viscous Flow
ME 235:	Compressible Flow
ME 237:	Energetics of Fluid Flow I
ME 254:	Intermediate Heat and Mass Transfer
ME 257:	Energy Technology I
ME 258:	Energy Technology II
ME 259:	Solar Heating and Cooling of Buildings
ME 260:	Heating and Air Conditioning of Buildings
ME 261:	Air Pollution I
ME 262:	Air Pollution II
ME 263:	Air Pollution Control Technology
ME 264:	Air Pollution Seminar
ME 265:	Air Pollution Meteorology
ME 280:	Intermediate Thermodynamics
ME 281:	Nonequilibrium Thermodynamics
ME 282:	Fossil Fuels
ME 283:	Nuclear Reactor Engineering I
ME 284:	Nuclear Reactor Engineering II
ME 287:	Heat Conduction
ME 290:	Kinetic Theory of Gases
ME 291–92:	Power Systems
ME 293:	Combustion
ME 294:	Wind Energy
ME 298:	Research
ME 299–300:	Thesis Research
ME 312:	Theory of Turbulence
ME 313:	Magnetofluidmechanics
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research
OR 201:	Survey of Operations Research Methods

Required courses for Degree Programs in Energy Technology (Option 1): MS—ApSc 211, 213, ME 221, 254, 257, 258, 280; Professional Degree—EngS 284, ME 292, 298; DSc—ApSc 212, 215 and ME 281.

Required courses for Degree Programs in Energy Systems (Option 2): MS—ApSc 213, ME 257, 258, 261, and OR 201; Professional Degree—EngS 284 and ME 298.

ENVIRONMENTAL ENGINEERING

Option I: Water and Wastewater Engineering

ApSc 211:	Analytical Methods in Engineering I
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
CE 211:	Physical Chemical Wastewater Treatment
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 216:	Advanced Hydrology
CE 219:	Groundwater and Seepage
CE 237:	Advanced Sanity Engineering Design
CE 240:	Environmental Microbiology
CE 241:	Environmental Chemistry
CE 242:	Solid Waste Disposal
CE 243:	Environmental Impact Assessment
CE 272:	Biological Wastewater Treatment

CE 273: Water Supply Engineering
CE 276: Water Resources Planning and Control
CE 277: Industrial Waste Treatment
CE 278: Pollutant Transport
CE 279: Unit Operations in Environmental Engineering
CE 280: Water Resources Systems
CE 298: Research
CE 299–300: Thesis Research
EngS 242: Materials Recycling and Recovery
ME 221: Intermediate Fluid Mechanics
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 263: Air Pollution Control Technology

Required courses for MS Degree: CE 211, 212, 240, 241, 272, 273.

Required courses for DSc Degree: ApSc 211, 213, CE 278, 279.

Option II: Air Pollution Engineering

ApSc 211: Analytical Methods in Engineering I
or
EngS 284: Numerical Methods in Engineering
ApSc 213: Analytical Methods in Engineering III
CE 211: Physical Chemical Wastewater Treatment
CE 240: Environmental Microbiology
CE 241: Environmental Chemistry
CE 272: Biological Wastewater Treatment
EAd 221–22: Environmental Management
EngS 207: Engineering Climatology
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 270: Theoretical Acoustics
EngS 274: Environmental Noise Control
ME 204: Advanced Instrumentation Techniques
ME 215: Theory of Vibrations
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engineering
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 257–58: Energy Technology
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 263: Air Pollution Control Technology
ME 264: Air Pollution Seminar
ME 265: Air Pollution Meteorology
ME 282: Fossil Fuels
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 291–92: Power Systems
ME 293: Combustion
ME 312: Theory of Turbulence

Required courses for MS Degree: ApSc 211 or EngS 284, ApSc 213, ME 221, 288, 261, 263.

ENVIRONMENTAL MODELING *

ApSc 211:	Analytical Methods in Engineering I
ApSc 213:	Analytical Methods in Engineering III
*EngS 263:	Atmospheric Physics for Engineers I
*EngS 264:	Atmospheric Physics for Engineers II
EngS 284:	Numerical Methods in Engineering
EngS 298:	Research
EngS 299–300:	Thesis Research
EngS 314:	Advanced Numerical Methods in Engineering
ME 221:	Intermediate Fluid Mechanics
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 257:	Energy Technology I
ME 265:	Air-pollution Meteorology
ME 285:	Reaction Kinetics
ME 288:	Convective Heat and Mass Transfer
ME 289:	Radiative Heat Transfer
ME 296:	Special Topics in Heat and Mass Transfer
ME 312:	Theory of Turbulence

FLUID MECHANICS AND THERMAL SCIENCES

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
CE 274:	Mechanics of Water Waves
EE 133:	Electromagnetic Waves
EE 236:	Plasma Dynamics
EngS 218:	Introduction to Continuum Mechanics
EngS 289:	Special Topics in Theoretical and Applied Mechanics
EngS 315:	Introduction to Nonlinear Mechanics of Continua
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 222:	Applied Fluid Dynamics
ME 223:	Aeroelasticity
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 235:	Compressible Flow
ME 277:	Numerical Methods in Fluid Mechanics
ME 280:	Intermediate Thermodynamics
ME 281:	Nonequilibrium Thermodynamics
ME 282:	Fossil Fuels
ME 287:	Heat Conduction
ME 288:	Convective Heat and Mass Transfer
ME 289:	Radiative Heat Transfer
ME 295:	Statistical Thermodynamics
ME 297:	Special Topics in Fluid Mechanics
ME 298:	Research
ME 299–300:	Thesis Research
ME 310:	Mechanics of Non-Newtonian Fluids

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ME 311: Nonsteady Flow
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 315: Hypersonic Flow
ME 317: Physical Gas Dynamics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

Required courses for MS Degree: ApSc 211, 213, ME 221, 280 (also ME 227 for non-thesis students); for Professional and DSc Degrees: Fluid Mechanics—ApSc 212 or 214 or 216, 215, ME 231, 288, 311, 312; Thermal Sciences—ApSc 212 or 214 or 216, 215, ME 235, 288, 287, 289.

GEOTECHNICAL ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 209: Theoretical Soil Mechanics
CE 210: Methods of Structural Analysis
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 219: Groundwater and Seepage
CE 221: Pavement and Runway Design
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 265: Special Topics in Geotechnical Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 256: Introduction to the Theories of Inelastic Media
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
*Geol 128: Geomorphology
*Geol 189: Geophysics for Geologists
*Geol 224: Advanced Structural Geology

Required courses for MS Degree: ApSc 211 or 213, CE 204, 205, 206 and EngS 285. For Professional Degree: CE 207, 208, 219, and EngS 221.

*For course descriptions, see the *Undergraduate and Graduate Bulletin*.

MECHANICAL ENGINEERING DESIGN

ApSc 213: Analytical Methods in Engineering III
CE 253: Failure and Reliability Analysis of Engineering Structures
EngS 215: Advanced Strength of Materials
EngS 251–52: Transportation Workshop
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 240: Kinematic Synthesis
ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 247: Fluidics
ME 251: Advanced Electromechanical Control Systems
ME 298: Research
ME 299–300: Thesis Research

Required courses for MS Degree: ApSc 213, ME 241, 243, 246.

OCEAN, COASTAL, AND MARINE ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 203: Prestressed Concrete Structures
CE 206: Foundation Engineering
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 265: Special Topics in Geotechnical Engineering
CE 274: Mechanics of Water Waves
CE 275: Special Topics in Ocean Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research

CE 399: Dissertation Research
EngS 228: Physical Oceanography
EngS 260: Random Process Theory in Engineering
EngS 273: Time Series Analysis
*Geol 181: General Oceanography
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 297: Special Topics in Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for degree programs in Hydromechanics: MS—ApSc 211, 213, EngS 260, and ME 221; DSc—ApSc 212, 214, 215, CE 274, ME 227, 312, 231.

Required courses for degree programs in Ocean, Coastal, and Marine Engineering: MS—ApSc 211, 213, EngS 260 and ME 221; DSc—ApSc 212, 215, CE 256, 274, ME 231, and ME 215 or EngS 273.

PUBLIC WORKS ENGINEERING

CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 208: Rock Engineering
CE 211: Physical and Chemical Wastewater Treatment
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 215: Urban Construction Technology
CE 216: Advanced Hydrology
CE 217: Water Resources Engineering
CE 220: Urban Transportation Engineering
CE 221: Pavement and Runway Design
CE 223: Traffic Engineering
CE 237: Advanced Sanitary Engineering Design
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 276: Water Resources Planning and Control
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels

*For course descriptions, see the *Undergraduate and Graduate Bulletin.*

EAd 204: Administration of Engineering Contracts
EAd 210: Engineering Law
EAd 241: Construction Management I
EAd 242: Construction Management II
EAd 243: Construction Management III
EAd 261: Economic Analysis in Engineering Planning
EngS 284: Numerical Methods in Engineering
OR 201: Survey of Operations Research Methods

Required courses for MS Degree: CE 202, 206, 220, 243, 276, and EAd 241 or 242 or 243; for Professional Degree: CE 211 or 217 or 223, EngS 284 or OR 201, and one additional course from the sequence EAd 241, 242, 243.

SOLID MECHANICS AND MATERIALS ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 207: Soil Dynamics
CE 209: Theoretical Soil Mechanics
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 215: Advanced Strength of Materials
EngS 217: Analytical Mechanics
EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 229: Transformations in Materials
EngS 230: Deformation of Materials
EngS 231: Structure of Materials
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 236: Experimental Techniques in Materials Science
EngS 237: Environmental Effects on Materials I
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 242: Materials Recycling and Recovery
EngS 249: Special Topics in Materials Science
EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 298: Research
EngS 299–300: Thesis Research
EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics

ME 221: Intermediate Fluid Mechanics
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 295: Statistical Thermodynamics
ME 310: Mechanics of Non-Newtonian Fluids

Required courses for degree programs in Solid Mechanics: MS—ApSc 211, 213, EngS 218, 221; Professional Degree—EngS 222, 240, 241, 256, 285: DSc—ApSc 212, 215, EngS 222, 230, 256, 315.

Required courses for degree programs in Materials Engineering: MS—ApSc 211, 213, EngS 229, 231; Professional Degree—EngS 230, 234, 237, 240, 241; DSc—ApSc 212, EngS 229, 230, 231, 240, 256.

STRUCTURAL ENGINEERING

ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 210: Methods of Structural Analysis
CE 215: Urban Construction Technology
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 261: Analysis of Plates and Shells
CE 262: Design of Plate and Shell Structures
CE 263: Theory of Structural Stability
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
CE 298: Research
CE 299–300: Thesis Research
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 215: Advanced Strength of Materials
EngS 221: Theory of Elasticity I
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
EngS 282: Computer-aided Design

EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics

Required courses for degree programs: MS—ApSc 213, CE 201 or 202, CE 210, EngS 215 or 284, 285; Professional—CE 250 or 251, CE 252 or 253, CE 262, and EngS 282 or 288; DSc—ApSc 212, 213 or 214, CE 252, 254, EngS 221, 288. One graduate-level course in Engineering Administration may be taken by students enrolled in this program.

STRUCTURES AND DYNAMICS

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
*CE 207: Soil Dynamics
*CE 210: Method of Structural Analysis
*CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
*CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazard I
*CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazard II
EE 157: Machine and Assembly Language Programming
*EngS 215: Advanced Strength of Materials
*EngS 217: Analytical Mechanics
*EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
*EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
*EngS 240: Fracture Mechanics
*EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
†EngS 281: Advanced Programming Techniques for Engineering Mechanics Problems
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
†EngS 286: Analysis and Design of Thin-walled Structures
†EngS 287: Automated Design of Complex Structures
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
*EngS 315: Introduction to Nonlinear Mechanics of Continua

*Course offered on campus only.
†Course offered at NASA-Langley Research Center only.

EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
*ME 223: Aeroelasticity
*ME 248: Seminar: Aircraft Design I
OR 251: Linear Programming
OR 252: Nonlinear Programming

Required courses for degree programs *on campus:* MS—ApSc 213, CE 253, 261, 263, EngS 215, and ME 215 or CE 252; DSc—ApSc 212, 214, ME 216, EngS 221, and 259.

Required courses for degree program at NASA-Langley Research Center: MS—ApSc 213, CE 261 or 263, EngS 221 or 234, 284, 285, 286 or 287; DSc—ApSc 214, EngS 288, ME 215 or 223, EngS 281.

TRANSPORTATION ENGINEERING

Option I: Technology of the Vehicle

ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 201: Design of Metal Structures
CE 210: Methods of Structural Analysis
CE 220: Urban Transportation Engineering
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 215: Advanced Strength of Materials
EngS 221: Theory of Elasticity I
EngS 241: Failure of Materials
EngS 251–52: Transportation Workshop
EngS 253: Control of Automated Transit Networks
EngS 259: Random Vibration of Structures
EngS 260: Random Process Theory in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 315: Introduction to Nonlinear Mechanics of Continua
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 223: Aeroelasticity
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 241: Engineering Systems Design
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 250: Design of Complex Systems
ME 251: Advanced Electromechanical Control Systems

*Course offered at NASA-Langley Research Center only.

ME 255–56:	Urban Transportation Technology
ME 275:	Stability and Control of Vehicles
ME 286:	Special Topics in Mechanical Engineering
ME 293:	Combustion
ME 298:	Research
ME 299–300:	Thesis Research
ME 311:	Nonsteady Flow
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research
*U&RP 208:	Urban Transportation Planning
*U&RP 209:	Urban Transportation Models

Required courses for MS Degree: (Mechanical)—CE 220, EngS 251, ME 221, 237; (Structural)—CE 210, 220, 252 and EngS 251.

For DSc Degree: (Mechanical)—ApSc 213, 215, ME 293 and ME 238 or 311; (Structural)—ApSc 213 or 214, CE 252, EngS 285, 288, 221 or 315.

Option II: The Way (Route Structures and Facilities)

ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 204:	Applied Soil Mechanics I
CE 205:	Applied Soil Mechanics II
CE 206:	Foundation Engineering
CE 207:	Soil Dynamics
CE 209:	Theoretical Soil Mechanics
CE 210:	Methods of Structural Analysis
CE 220:	Urban Transportation Engineering
CE 221:	Pavement and Runway Design
CE 222:	Stations and Terminals
CE 223:	Traffic Engineering
CE 252:	General Structural Dynamics
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 256:	Introduction to Ocean and Coastal Engineering
CE 257:	Harbor and Coastal Engineering I
CE 258:	Harbor and Coastal Engineering II
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
EngS 215:	Advanced Strength of Materials
EngS 221:	Theory of Elasticity I
EngS 240:	Fracture Mechanics
EngS 241:	Failure of Materials
EngS 251–52:	Transportation Workshop
EngS 253:	Control of Automated Transit Networks
EngS 259:	Random Vibration of Structures
EngS 285:	Finite Element Methods in Engineering Mechanics
EngS 288:	Advanced Finite Element Methods in Structural Mechanics
EngS 298:	Research
EngS 299–300:	Thesis Research
EngS 315:	Introduction to Nonlinear Mechanics of Continua
EngS 398:	Advanced Reading and Research

* For course descriptions, see the *Undergraduate and Graduate Bulletin.*

EngS 399: Dissertation Research
ME 255–56: Urban Transportation Technology
OR 231: Theory of Traffic Flow
*U&RP 208: Urban Transportation Planning
*U&RP 209: Urban Transportation Models

Required courses for degree programs: MS—CE 201 or 202, 210, 220, 221 or 223, and EngS 251; DSc—ApSc 212, 213 or 214, CE 252, EngS 285, 288, and EngS 221 or 315.

Option III: Transportation Systems†

CE 220: Urban Transportation Engineering
CE 223: Traffic Engineering
CE 243: Environmental Impact Assessment
EAd 261: Economic Analysis in Engineering Planning
EAd 265: Transportation Management I
EAd 266: Transportation Management II
EAd 281–82: Systems Analysis and Management
EngS 251–52: Transportation Workshop
EngS 253: Control of Automated Transit Networks
ME 255–56: Urban Transportation Technology
ME 298: Research
ME 299–300: Thesis Research
OR 201: Survey of Operations Research Methods I
OR 202: Survey of Operations Research Methods II
OR 231: Theory of Traffic Flow
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
*U&RP 201: Introduction to Urban and Regional Planning
U&RP 208: Urban Transportation Planning
*U&RP 209: Urban Transportation Models

Required courses for MS degree: CE 220, 223, EngS 251, and OR 201.

WATER RESOURCES ENGINEERING

Option I: Water Resources Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 243: Environmental Impact Assessment
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 273: Water Supply Engineering

*For course descriptions, see the *Undergraduate and Graduate Bulletin.*
†Prerequisite courses for admission to this option are ApSc 115 and Stat 191 (see the *Undergraduate and Graduate Bulletin).*

CE 274:	Mechanics of Water Waves
CE 276:	Water Resources Planning and Control
CE 278:	Pollution Transport System
CE 279:	Unit Operations in Environmental Engineering
CE 281:	Special Topics in Water Resources
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
CE 312:	Advanced Hydraulics
CE 398:	Advanced Reading and Research
CE 399:	Dissertation Research
EngS 260:	Random Process Theory in Engineering
EngS 284:	Numerical Methods in Engineering
EngS 285:	Finite Element Methods in Engineering Mechanics
ME 221:	Intermediate Fluid Mechanics
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 277:	Numerical Methods in Fluid Mechanics
ME 312:	Theory of Turbulence
OR 251:	Linear Programming
OR 252:	Nonlinear Programming
OR 273:	Digital Systems Simulation

Required courses for degree programs: MS—ApSc 211 and/or 213 (depending on adviser's approval), CE 212, 213, ME 221; Professional and DSc—ApSc 213, 215, CE 282, 312, ME 231.

Option II: Water Resources Planning

ApSc 213:	Analytical Methods in Engineering III
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams
CE 216:	Advanced Hydrology
CE 242:	Solid Waste Disposal
CE 243:	Environmental Impact Assessment
CE 273:	Water Supply Engineering
CE 276:	Water Resources Planning and Control
CE 278:	Pollution Transport System
CE 279:	Unit Operations in Environmental Engineering
CE 280:	Water Resources Systems
CE 281:	Special Topics in Water Resources
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
EAd 211–12:	Engineering Administration
EAd 269:	Elements of Decision-making and Problem-solving
EAd 283:	Systems Engineering I
EAd 284:	Systems Engineering II
EngS 206:	Technology and Human Needs
EngS 213:	Renewable Resources
EngS 260:	Random Process Theory in Engineering
EngS 284:	Numerical Methods in Engineering

ME 221: Intermediate Fluid Mechanics
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 377: Advanced Stochastic Models in Operations Research
*Econ 217–18: Survey of Economics
*Econ 235: Energy Resources and Policy
*Econ 237: Seminar: Economics of the Environment and Natural Resources
*Geog 222: Seminar: Resources and the Environment
*Geog 223: Seminar: The Population-Food Balance
*PSc 206: Science, Technology, and Public Affairs

Required courses for MS degree: CE 212, 213, 276, 280.

Civil Engineering Graduate Courses

201 Design of Metal Structures (3)

Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)

202 Design of Reinforced Concrete Structures (3)

Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)

203 Prestressed Concrete Structures (3)

Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent. (Spring)

204 Applied Soil Mechanics I (3)

Theories of soil strength; bearing capacity of shallow foundations and their design; deep foundations, including pile types and design criteria; theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Spring)

205 Applied Soil Mechanics II (3)

Nature of soil, including geological and pedological aspects; flow of water in soil; seepage involving foundations, dams, and wells; stress distribution in earth masses; one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Fall)

206 Foundation Engineering (3)

Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of Department. (Spring)

*For course descriptions, see the *Undergraduate and Graduate Bulletin*.

207 **Soil Dynamics** (3)

Stress-strain behavior of soil under transient and repeated loads, effects of earthquakes upon foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (As arranged)

208 **Rock Engineering** (3)

Classification and properties of rock; nature of rock masses and rock discontinuities; field exploration; methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite: approval of Department. (As arranged)

209 **Theoretical Soil Mechanics** (3)

Advanced theories of consolidation. Yield condition in soils. Application of theories of plasticity in soil mechanics. Elements of wave propagation in soils, including surface waves. Prerequisite: ApSc 213, and CE 204 or 205. (As arranged)

210 **Methods of Structural Analysis** (3)

Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods, substructuring techniques; consideration of plastic collapse of structures; introduction to the finite element method. Prerequisite: graduate status. (Fall)

211 **Physical and Chemical Wastewater Treatment** (3)

Theory and application of physical and chemical operation and processes for wastewater treatment. Topics of discussion will include sedimentation; flotation; disinfection; coagulation; flocculation; filtration; carbon adsorption; reverse osmosis; ion exchange and thickening. Prerequisite: CE 197 or equivalent; prerequisite or concurrent registration: CE 241. (Fall)

212 **Open Channel Flow** (3)

Types and regimes of flow; energy and momentum principles, uniform flow, gradually varied flow, spatially and rapidly varied flow. Flow in non-prismatic channels. Unsteady flow; dam break problem, flood routing. Prerequisite: CE 193 or ME 221. (Fall)

213 **Hydraulic Structures** (3)

Forces on structures and hydraulic design criteria. Design of conveyance, diversion, cross drainage, protective and water measurement structures. Prerequisite: CE 212 or approval of Department. (Spring)

214 **Design of Dams** (3)

Project planning and investigations. Types of dams; design of earth-rock fill dams and concrete gravity dams. Design of outlets, spillways, and appurtenances. Construction methods for dams. Reservoir sedimentation. Safety inspection of dams. Prerequisite: CE 193 or graduate status. (Spring, even years)

215 **Urban Construction Technology** (3)

Precedents and contemporary trends in urban housing, building, and planning technology. Prerequisite: approval of Department. (Spring)

216 **Advanced Hydrology** (3)

Precipitation, evaporation, and transpiration. Soil physics; stream flow, drainage basins, hydrograph analysis, and stream-flow routing. Design

criteria, flood frequency statistics and analysis, flood forecasting and control, water supply forecasting. Prerequisite: CE 195 or equivalent. (Spring)

219 Groundwater and Seepage (3)

Permeability theory of groundwater flow, flownets, analogs, computer solutions; applications to engineering problems such as excavation dewatering, flow through dams, stabilization of earth slopes. Prerequisite: ApSc 211. (Fall)

220 Urban Transportation Engineering (3)

Introduction to urban transportation planning. Analysis of urban transportation requirements. Evaluation procedure for the selection between alternative solutions. Prerequisite: approval of Department. (Fall and spring)

221 Pavement and Runway Design (3)

Pavement types, wheel-load characteristics; stresses in pavements and subgrades; empirical methods of design of flexible and rigid highway and airfield pavements; general principles of runway design. Prerequisite: CE 202, and 204 or 205. (Spring)

222 Stations and Terminals (3)

Unified treatment of the functions and operation of stations and terminals of transportation systems; emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intramodal and inter-modal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of Department. (Spring)

223 Traffic Engineering (3)

Roadway traffic capacity and other road network performance measures; methods of characterizing steady and unsteady traffic flow phenomena; traffic behavior monitoring techniques, instruments, and data processing; impact of vehicle and operator dynamics on traffic flow behavior; road bottleneck flow dynamics; traffic control signalization theory and practical implementation; traffic signal control systems for conventional street networks and limited access expressways; examples of traffic control system implementations. Prerequisite: approval of Department. (Fall)

237 Advanced Sanitary Engineering Design (3)

Basic principles and practical considerations; hydraulic and structural requirements; basic parameters and elements of design; layout and design of water supply and sewage systems, pumping stations, and wastewater treatment plants; development of design parameters; cost and financing; existing plant expansions. Prerequisite: graduate status. (Fall)

240 Environmental Microbiology (3)

Basic cellular organizations and processes related to waste treatment; microorganisms as disease-carrying agents in natural and waste water; laboratory tests for coliform organisms and viruses, and analysis of activated sludge. Prerequisite: approval of Department. (Spring)

241 Environmental Chemistry (3)

Chemical composition and chemical analysis of water; chemical treatment of water and waste water; laboratory tests of solids, BOD, COD, phos-

phorus, nitrogen, etc., as related to water quality. Prerequisite: approval of Department. (Fall)

242 **Solid Waste Disposal** (3)

Characteristics of solid waste; collection, transportation, and disposal practices; regional planning and management; resource and energy recovery from solid waste. Prerequisite: approval of Department. (Fall)

243 **Environmental Impact Assessment** (3)

Public policy and legislation at federal, state, and local levels concerning quality of the environment. Strategies and methodologies which have been developed to assess impact of engineering projects. Technology of assessing impact on air and water quality and on land use, applied to transportation facilities, water supply and pollution control facilities, and industrial and community development. Prerequisite: approval of Department. (Fall)

250 **Advanced Metal Structures** (3)

Conception, analysis, and design of low-rise and high-rise buildings by elastic and inelastic methods, suspended roofs, earthquake considerations, and unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)

251 **Advanced Reinforced Concrete Structures** (3)

Conception, analysis, and design of low-rise and high-rise buildings by ultimate strength methods, precast systems, progressive collapse, earthquake considerations, domes, folded plates, shell-type structures and special topics. Prerequisite: CE 202 or equivalent. (Spring)

252 **General Structural Dynamics** (3)

Analysis of single and multiple degree of freedom structural system under steady-state and transient loads; response of discretized structural systems, such as rigid frames, plates, and thin shells under dynamic loads, including earthquakes, wind, and blast loading; introduction to probabilistic methods in structural dynamics. Prerequisite: ApSc 115, CE 210, or equivalent; and approval of Department. (Spring)

253 **Failure and Reliability Analysis of Engineering Structures** (3)

Operational and structural failure mechanisms; instability, fracture, and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Prerequisite: ApSc 115 or equivalent. (Fall)

254 **Special Topics in Structural Engineering** (3)

Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) advanced structural applications. May be repeated for credit. Prerequisite: CE 210 and approval of Department. Topic to be announced in the *Schedule of Classes*. (As arranged)

255 **Coastal Processes** (3)

Longshore currents and nearshore circulation; coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport of sandy dune stabilization, sediment tracing. Prerequisite: approval of Department. (Spring)

256 **Introduction to Ocean and Coastal Engineering** (3)

Application of wave mechanics to the analysis of wave motion in coastal and offshore regions: reflection, diffraction, refraction. Wave spectra: procurement of spectral data by direct measurement or from hind-casting techniques. Beaches and littoral drift, mixing processes, outfalls and intakes in the oceans and estuaries, wave forces on coastal and offshore structures, harbor oscillations, tides in estuaries. Prerequisite: ApSc 115, ME 221; or equivalent. (Fall)

257 **Harbor and Coastal Engineering I** (3)

Waves and swells, tides and currents, coastal regime, estuaries and deltas, structures for coastal protection, principles of harbor navigation, harbor planning and harbor design, breakwaters and sea walls, quays, docks, internal access structures; maintenance of external and internal access, dredging. Prerequisite: CE 256. (Spring)

258 **Harbor and Coastal Engineering II** (3)

Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures; off-shore drilling platforms. Design criteria, moorings and cables, harbor operations equipment. Prerequisite: CE 252 or equivalent; CE 257. (Fall)

261 **Analysis of Plates and Shells** (3)

Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status. (Spring)

262 **Design of Plate and Shell Structures** (3)

Design of long-span plate and shell roof structures in reinforced concrete and metal; design of containers for fluids and granular materials; computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall)

263 **Theory of Structural Stability** (3)

General criteria for stability; buckling of elastic and inelastic columns and frames; torsional and lateral buckling; variational methods. Buckling of plates and shells under static loads; stability of stiffened structures; effect of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)

265 **Special Topics in Geotechnical Engineering** (3)

Selected topics such as rheology of soils, computer applications, excavation and tunneling, ocean engineering problems, or other special topics. May be repeated for credit. Prerequisite: approval of Department. (As arranged)

266 **Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I** (3)

Nature of dynamic loads in problems which arise from earthquakes, tornadoes, hurricanes, and recurring winds; other natural hazard loading such as floods, expansive soils, storm surges, and tsunamis; characteristics of earthquakes; seismicity, zoning maps, response spectra, wind characterization, and wind tunnel simulation. Use of probabilistic concepts in load determination. Prerequisite: approval of Department. (Spring)

267 Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II (3)

Brief review of natural hazard loadings and random formulation; earthquake and wind design considerations and procedures; review of code requirements and specifications; balanced risk approach for natural hazards; cost effectiveness of integrated natural hazard design; special problems. Prerequisite: CE 266 or approval of Department. (Fall)

271 Theoretical Marine Hydromechanics (3)

Introductory course designed to acquaint the student with some physical concepts and mathematical tools of theoretical marine hydromechanics. Derivation of the fundamental equations and boundary conditions of a fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of Department. Offered off-campus only. (As arranged)

272 Biological Wastewater Treatment (3)

Theory and application of biological methods for wastewater treatment. Principles of biological treatment; biological lagoons; trickling filter activated sludge process; anaerobic and aerobic digestion of sludge. Prerequisite or concurrent registration: CE 240. (Spring)

273 Water Supply Engineering (3)

Quantity and quality aspects of water supply engineering are discussed. Topics include reservoir sizing, groundwater, distribution systems, treatment processes and chemistry of waters. Prerequisite or concurrent registration: CE 240 and 241. (Fall)

274 Mechanics of Water Waves (3)

Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state-of-the-art based on correlation between theory and measurements. Wave-breaking and reflexion. Prerequisite: ME 221 or equivalent and permission of instructor. (Fall)

275 Special Topics in Ocean Engineering (3)

Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of Department. (Spring)

276 Water Resources Planning and Control (3)

The parameters of water resources planning and control; economics of water resources and related natural resources; economics of water quality control; physical parameters of water resource development; water resources law. Prerequisite: approval of Department. (Fall)

277 Industrial Waste Treatment (3)

The nature of industry and waste generation; industrial waste characteristics; waste measurements; techniques utilized in industrial waste treatment and control; nuclear waste control; reuse of industrial effluents and sewage for industrial process water; problems associated with treatment and disposal of industrial wastes and their effects on receiving waters.

Prerequisite: CE 211 or equivalent; prerequisite or concurrent registration: CE 240. (Fall)

278 **Pollution Transport System** (3)

Distribution of pollutants in natural waters and atmosphere; diffusive and advective transport; mathematics for stream pollutant deoxygeneration rates; groundwater pollution transport; sediment transport; thermal transport; numerical simulation of pollutant transports in streams and estuaries. Prerequisite: CE 193, ME 131. (Fall)

279 **Unit Operations in Environmental Engineering** (3)

Lecture and laboratory. Investigation of unit processes used in water and wastewater treatment. Current literature is reviewed and experiments carried out. Prerequisites or concurrent registration: CE 211, 272. (Spring, alternate years)

280 **Water Resources Systems** (3)

Water resources planning and control; water quality planning, water supply planning, comprehensive planning and management. Case studies of systems. Prerequisite: CE 276. (Spring)

281 **Special Topics in Water Resources** (3)

Selected Topics: morphometric properties of drainage basins; drainage network analysis; hydraulic geometry of streams; advanced hydraulics of alluvial channels; modeling of drainage basins; computer applications; stochastic hydrology. Prerequisite: approval of Department. (As arranged)

282 **Hydraulic Modeling** (3)

Dimensional analysis and similitude. Types of models; physical models, mathematical models. Distortions in physical models. Erodible bed models. Prerequisite: CE 193 or ME 221 or graduate status. (Spring, odd years)

298 **Research** (arr.)

Basic research projects, as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

310 **Sedimentation Engineering** (3)

Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of Department. (Fall)

311 **Mechanics of Alluvial Channels** (3)

Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of Department. (Spring)

312 **Advanced Hydraulics** (3)

Continuity, energy, and momentum equations. Turbulence, diffusion, and dispersion. Cavitation, waves, subsurface flow. Special problems in flow through hydraulic and marine structures. (Summer)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Mechanical Engineering Graduate Courses

204 **Advanced Instrumentation Techniques** (3)

Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques; digital techniques; signal multiplexing; use of computers; error analysis and data handling. Lecture and laboratory. Prerequisite: approval of Department. (Fall)

215 **Theory of Vibrations** (3)

Damped and undamped natural vibrations, transient response and response to harmonic and periodic excitation, natural vibration of discrete and continuous systems; integral formulation of eigenvalue problems, response by modal analysis, approximate methods, influence of secondary effects and constraints, damped systems. Prerequisite: approval of Department. (Fall)

216 **Structural Dynamics** (3)

Methods of solving vibration problems: differential equation, Rayleigh-Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215. (As arranged)

218 **Design of Floating and Submerged Marine Vehicles** (3)

Consideration of interaction between hydrodynamics, propulsion, and configuration aspects of design of floating structures and vehicles; effects of submergence and deep submergence; hydrofoil and vertical jet action; structural considerations. Prerequisite: EngS 228. (Fall)

221 **Intermediate Fluid Mechanics** (3)

The continuum, kinematics of fluids; stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids; Laplace's equations; source, sink, and doublet; vortices, Biot-Savart theorem and the flow field of a vortex; spherical and cylindrical harmonics; methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of Department. (Fall)

222 **Applied Fluid Dynamics** (3)

Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing-body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils, effect of wing sweep, area ruling concept; supersonic linearized wing theory; similarity rules. Prerequisite: ME 221 or equivalent. (Spring)

223 **Aeroelasticity** (3)

Introduction to aeroelastic phenomena; structural deformations of vehicles under static and dynamic loads; vibrations of vehicle structures; static aeroelastic problems (structural deformation, divergence, control effectiveness, and reversal); flutter theory and calculation of flutter boundaries; aerodynamics of steady and nonsteady two-dimensional wings in subsonic, sonic, and supersonic flow; strip theory applications of two-dimensional aerodynamics to three-dimensional lifting surfaces; piston theory and Newtonian-flow theory. Prerequisite: ME 215, 221; or equivalent. (Fall)

224 **Fundamentals of Combustion Engines** (3)

Classification of combustion engines: air cycles, vapor cycles, external combustion engines, internal combustion engines; rotary engines, reciprocating engines, and turbomachinery; ideal cycle analysis; engine heat losses and friction; practical cycle analysis status of computerized cycle analysis; combustion and knocking; carburetion and fuel injection; mixture distribution; valve mechanism; ignition systems; combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of Department. (Fall)

225 **Turbomachinery I** (3)

Turbine, compressor, and pump types and uses; dimensional analysis of turbomachines; cycle analysis of gas and steam turbines; energy interchange in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, compressors, and pumps. Prerequisite: ME 221. (Fall)

226 **Turbomachinery II** (3)

Aerodynamics of aerofoils, flow in cascades, axial compressor aerodynamic design, axial turbine aerodynamic design, compressor and turbine matching. Combustion fundamentals, combustion chemistry, and gas turbine combustion chamber design. Prerequisite: ME 225. (Spring)

227 **Viscous Flow** (3)

Exact solutions of Navier-Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and the techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat transfer problems; flow separation. Prerequisite: ApSc 213; and ME 221 or equivalent. (Fall)

231 **Hydrodynamics** (3)

Flow at large Reynolds number: vorticity dynamics, Kelvin's theorem in inviscid flow, vorticity in motions generated from rest, boundary layers, applications of the momentum theorem. Irrotational flow theory: applications of Bernoulli and momentum theorems to steady flows, flow due to a rigid body, two-dimensional motion and applications of complex variable theory, free surface flows, Froude numbers, criterion of dynamic similarity. Effectively inviscid flow with vorticity: sheet vortex, flow with swirl, vortex system of a wing. Prerequisite: ME 221 or equivalent. (Spring)

235 **Compressible Flow** (3)

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role

of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; and ME 221 or equivalent. (Spring)

237 Energetics of Fluid Flow I (3)

Energy transformations in fluid flows. Gas dynamics of combustion. Nonuniform flow, mixing. Mechanisms of flow induction. Applications to pumping, propulsion in water, air, and space, and thrust augmentation. Prerequisite: ME 155 or equivalent. (Spring)

238 Energetics of Fluid Flow II (3)

Wave processes and their utilization. Static, dynamic, and cryptosteady pressure exchange; energy equalizers and dividers. Advanced concepts of air and marine propulsion. Discussion of various concepts of flow induction, thrust generation, and environmental control. Prerequisite: ME 237 or equivalent. (Spring)

240 Kinematic Synthesis (3)

Techniques for the analysis and synthesis of function, path, and motion generating mechanisms. Algebraic and graphical methods for the dimensional design of mechanisms having prescribed performance characteristics. Design for higher-order requirements. Computer-aided techniques for the optimal design of planar linkages using Burmester theory, complex number stretch-rotation operators, Chebyshev polynomials, etc. Review of recent developments and current research. Term project. (As arranged)

241 Engineering Systems Design (3)

Principles of systems design; interdisciplinary system simulation for mechanical, electrical, fluid, and thermal sciences; dynamic response of systems; mathematical model and analogy studies; optimization techniques with computer-aided solutions. Prerequisite: approval of Department. (Spring)

242 Advanced Mechanisms (3)

Emphasis on spatial kinematics but with some attention to classical theorems of plane kinematics. Analysis and synthesis of mechanisms. Analytical techniques using matrices, dual numbers, quaternion algebra, finite and instantaneous screws, theory of envelopes. Applications to design of linkages, cams, gears, machined surfaces. Use of digital computers in mechanism analysis and design. Prerequisite: ME 240. (Fall, alternate years)

243 Advanced Mechanical Engineering Design (3)

Design of mechanical engineering systems, components, and equipment; requires the integration of engineering disciplines at an advanced level. Prerequisite: approval of Department. (Fall)

246 Electromechanical Control Systems (3)

System synthesis, compensation, and stabilization using Bode diagrams, root locus, etc.; linear and nonlinear characterization of mechanical, electromechanical, and electronic control components. Prerequisite: approval of Department. (Fall)

247 Fluidics (3)

Introduction of fluidic components and systems: behavior and modeling of bistable and proportional jet devices, vortex amplifiers and sensors.

passive elements, transmission lines; system synthesis, coupling effects. Survey of current applications and research. Prerequisite: approval of Department. (Spring)

*248 **Seminar: Aircraft Design I** (3)

Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of Department. (As arranged)

*249 **Seminar: Aircraft Design II** (3)

Aircraft design in relation to prescribed mission requirements, different configurative concepts, detail design features. Estimation of weight, size, and power of an aircraft to satisfy mission specifications; design tradeoffs and compromises. Emphasis on subsonic aircraft for steady cruising flight missions. Jet-powered and propeller-driven aircraft; supersonic cruising aircraft. Prerequisite: approval of Department. (Spring)

251 **Advanced Electromechanical Control Systems** (3)

Time domain analysis and design of electromechanical control systems using state space methods and matrix differential equation techniques. Advanced stability analysis and design optimization techniques for both linear and nonlinear systems. Examples taken from practical mechanical components and systems including continuous and discrete time systems. Introduction to electromechanical switching system theory and practice. Prerequisite: ME 246. (As arranged)

254 **Intermediate Heat and Mass Transfer** (3)

Fundamentals of heat and mass transfer, its laws and properties. Conduction equations and solutions for steady and transient cases. Convection of heat and mass. Dimensionless numbers and boundary layer concepts. Laminar, transition, and turbulent flows. Radiation in transparent media and at surfaces. Application to combustors and solar devices. Prerequisite: ApSc 213. (Fall)

255 **Urban Transportation Technology** (3)

An introduction to the technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching systems, life cycle costs, and measures of system effectiveness. Prerequisite: approval of Department. (Fall)

257 **Energy Technology I**

An overall view of energy technology, supply and demand, and the relation among energy, environment, and institutional problems. Regression analysis, forecasting of supply and demand, energy systems modeling, analysis of cycles, Second Law analysis, nuclear energy, and energy transmission. Prerequisite: approval of Department. (Fall)

258 **Energy Technology II**

Continuation of ME 257. Various forms of solar energy (e.g., heating and cooling, photovoltaics, wind, biomass, ocean thermal gradients), tidal energy, geothermal energy, energy and food production, energy systems design, and energy policy. Prerequisite: ME 257. (Spring)

*fered at NASA-Langley Research Center; may be offered on campus when arranged.

259 Solar Heating and Cooling of Buildings (3)

Availability of solar energy, climatic data for solar heating and cooling. Passive, active and hybrid systems. Methods of solar energy collection and storage. Subsystems performance evaluations; systems analysis by computer methods; long-term performance predictions. System configurations, control requirements. Solar heating and cooling system economics; architectural features and considerations, standards. Prerequisite: approval of Department. (Fall)

260 Heating and Air Conditioning of Buildings (3)

Basic concepts and engineering data including psychometrics and comfort conditions. Heating and cooling load calculations, computer programs for system design and for energy consumption analysis. Codes and standards for building energy management, energy conservation opportunities. Heating and air conditioning systems; all air, air and water, all water systems, central control systems. Cost estimates and economic analyses, life-cycle costing. Prerequisite: ME 187 or equivalent. (Spring)

261 Air Pollution I (3)

An introductory course on the generation, monitoring, and control of air pollution. Elements of the system: generation of particulate and gaseous pollutants in natural, industrial, and energy-generating systems; their transformation as they diffuse into the dynamic sun-irradiated atmosphere; assessment of their impact through monitoring and inventory of emissions sources. Effects on health and welfare on urban, regional, and global scales. Air pollution standard setting and control strategy development. Prerequisite: approval of Department. (Fall)

262 Air Pollution II (3)

Laboratory and field survey and assessment of air pollution problems. A variety of laboratory techniques will be used to measure actual ambient air quality, and laboratory and field sampling of pollutant levels inside and immediately outside combustion systems will be conducted. Diffusion and chemical models will be used to relate sources and sensors of air pollution. A field air pollution impact assessment project will culminate the course activity. Prerequisite: ME 261 or equivalent. (Spring)

263 Air Pollution Control Technology (3)

Theoretical and applied aspects of aerosol and gaseous emission control from both stationary and mobile sources. Aerosol controls: sedimentation, precipitation, filtration, and wet collection. Application of scrubbers, catalysts, and combustion modification to control of gaseous emissions from stationary sources. Special techniques for fine particulate control (fabric, electrostatics). Control of automotive emissions through engine modification, catalysts, and alternative power systems. Vapors, odors, and noise. Prerequisite: ME 261 or equivalent. (Spring)

264 Air Pollution Seminar (3)

Special interest and advanced topics not covered in ME 261, 262, or 263. Special lectures by individual experts. Participants will be required to conduct a special topic study for contribution to the seminar. Prerequisite: approval of Department. (Fall)

265 Air Pollution Meteorology (3)

Weather and motion systems of atmosphere; ground- and upper-level air conditions; atmospheric stability and inversions; atmospheric turbulence

and diffusion; urban and topographic effects upon meteorological parameters; effects of meteorological parameters upon transportation and diffusion of pollutants; meteorological factors in plant location, design, and operation, and in urban planning. Prerequisite: ME 221 or equivalent. **(Fall)**

*269 **Wind Tunnel Research Techniques** (3)

A comprehensive survey of wind tunnel research facilities and techniques; subsonic, transonic, supersonic, and hypersonic facilities; basic principles of wind tunnel design; associated research equipment including models, balances, instrumentation, and flow visualization techniques; data acquisition and reduction; research methods; static and dynamic testing techniques; powered-model testing; typical research data; significant research contribution. Prerequisite: approval of Department. (Spring)

*270 **Aerodynamics of Flight Vehicles** (3)

Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent. **(Spring)**

*271 **VTOL Aircraft Technology** (3)

Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects; transition aerodynamics; theoretical stability and control and correlation with flight data; ground-effect theory and experiment; handling qualities criteria; elements of instrument approach and landing problem. Prerequisite: approval of Department. (Spring)

*272 **Powered-Lift Technology** (3)

Basic principles of powered-lift aircraft; high-lift aerodynamics; low-speed stability and control; fundamentals of internally blown and externally blown powered-lift concepts; the spanwise blowing scheme to delay wing stall; use of powered-lift for improved maneuverability of fighter aircraft; aerodynamic ground effects; alleviation of noise of powered-lift systems; aerodynamic loads associated with blown flaps. Prerequisite: approval of Department. (Fall)

*273 **Principles of Automatic Flight Control** (3)

Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of Department. (Fall)

*274 **Principles of Flight Guidance** (3)

Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)

275 **Stability and Control of Vehicles** (3)

Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency response analysis. Prerequisite: approval of Department. (As arranged)

*ed at NASA-Langley Research Center; may be offered on campus when arranged.

***276 Mechanics of Space Flight** (3)

First- and second-order Hamilton-Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of Department. (As arranged)

277 Numerical Methods in Fluid Mechanics (3)

Numerical solution of partial differential equations of fluid flow; finite-difference techniques for viscous and inviscid flows; stability; methods of characteristics; boundary conditions; applications in subsonic and supersonic flows. Prerequisite: ApSc 213, EngS 284; or equivalent. (As arranged)

***279 Special Topics in Flight Sciences** (3)

280 Intermediate Thermodynamics (3)

Thermodynamic systems; Gibbs equations; potentials, thermodynamic relationships, equilibrium and stability. Statistical thermodynamics; probability and macrostates; properties of perfect gases, mixtures, and crystals. Elements of kinetic theory and its application to transport properties. Introduction to relativistic thermodynamics. Application to chemical reactions, thermal radiation, magnetic, electric, and solid systems. Prerequisite: approval of Department. (Fall)

281 Nonequilibrium Thermodynamics (3)

Molecular theories of gases; thermodynamic properties and Boltzmann's integro-differential equation, the H-theorem and entropy; equations of state and potentials; the equation of change and velocity distribution outside equilibrium; transport properties. Field theory. Constitutive, balance, and Gibbs equations. Variational principles. Application to transport processes in engineering systems. Prerequisite: ME 280. (Spring)

282 Fossil Fuels (3)

Coal, petroleum, and natural gas. Fossil fuel reserves, methodologies of estimating and exploring for fossil fuels. Geophysical, geochemical, and satellite techniques. Prerequisite: Chem 152. (As arranged)

283 Nuclear Reactor Engineering I (3)

World energy resources and the importance of fission energy; atomic and nuclear structure; nuclear fission and chain reaction; critical mass; nuclear reactor classification; history of reactor development; nuclear reactions and radiations; radioactive decay; radiation detection, hazards, and protection; neutron reactions; neutron diffusion and slowing down; the criticality condition; reflected reactors; homogeneous and heterogeneous reactor systems; transient reactor behavior and control; description of pressurized and boiling water reactors; other reactor systems. Environmental considerations; reactor safety. Prerequisite: approval of Department. (Fall)

284 Nuclear Reactor Engineering II (3)

Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor materials problems; reactor fuels; shielding; mechani-

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

cal and structural components; preliminary reactor design; fuel cycles; description of nuclear reactor systems; engineered safety systems; the economics of nuclear power. Prerequisite: ME 283. (Spring)

*285 **Reaction Kinetics** (3)

Theoretical aspects of kinetics of homogeneous and heterogenous reactions in gaseous and liquid systems. Prerequisite: ME 280. (Spring)

286 **Special Topics in Mechanical Engineering** (3)

Prerequisite: approval of Department. (As arranged)

287 **Heat Conduction** (3)

Conduction of heat through solid, liquid, and gaseous media; formulation and methods of analytical, numerical, and analog solutions; steady two- and three-dimensional problems, problems in unsteady heat conduction; conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall)

288 **Convective Heat and Mass Transfer** (3)

Heat and momentum transfer in laminar and turbulent flow; application of boundary-layer theory to problems of forced convection; the laminar boundary-layer and similarity solutions; heat convection in turbulent flow, momentum-heat transfer analogy; the influence of temperature-dependent fluid properties; convective heat transfer at high velocities; mass transfer; formulation of a simplified theory; some solutions to the conserved property equation. Prerequisite: ME 221 or equivalent. (Spring)

289 **Radiative Heat Transfer** (3)

Nature of thermal radiation; radiative characteristics of surfaces; thermal radiation within evacuated enclosures; configuration factors algebra; solution methods for the integral equations of radiant interchange; enclosures containing an absorbing and emitting medium; absorbing, emitting, and scattering media; combined radiation, conduction, and convection. Prerequisite: ApSc 214 or equivalent. (Fall)

*290 **Kinetic Theory of Gases** (3)

Equation of state and physical properties for gas composed of discrete particles; relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities; Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280. (Spring)

291–92 **Power Systems** (3–3)

Design of thermal power system components and system optimization. Steam cycle power generation system components: steam generators, reactor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations; testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)

293 **Combustion** (3)

Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, hetero-

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

geneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of Department. (Spring)

294 **Wind Energy** (3)

Technical and economic problems of energy extractions from wind. Examination of the morphology of conversion devices; energy extraction from a moving fluid stream; aerodynamics of rotors. Nature of the wind, its special, temporal, and terrain-dependent variables. Structural, dynamic, and electrical problems and requirements; systems tradeoffs in wind turbine design. A wind turbine will be designed. Prerequisite: approval of Department. (Fall)

295 **Statistical Thermodynamics** (3)

Distribution functions; Boltzmann, Bose-Einstein, and Fermi-Dirac statistics; partition functions, correspondence between classical and statistical thermodynamics. Systems with negligible effects of interparticle forces; perfect gases, perfect electron gas, photon gas. The Debye solid, the Einstein solid. Prerequisite: ME 280. (Spring)

296 **Special Topics in Heat and Mass Transfer** (3)

Prerequisite: approval of Department. (As arranged)

297 **Special Topics in Fluid Mechanics** (3)

Prerequisite: approval of Department. (As arranged)

298 **Research** (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

310 **Mechanics of Non-Newtonian Fluids** (3)

Classification of fluids; physical properties of composite fluids; convected coordinate systems; fundamentals of constitutive equations of composite fluids; purely viscous fluids, Reiner and Rivlin theories, power-law fluids; linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear viscoelasticity; nonlinear theory of viscoelasticity, Rivlin-Ericksen theory; viscoplastic fluids, Bingham plastic fluids, Oldroyd's analysis; viscometry and rheogoneometry; turbulent flow of suspensions and emulsions in pipes; frictional drag reduction by polymeric additives. Prerequisite: approval of Department. (Fall)

311 **Nonsteady Flow** (3)

Eulerian and Lagrangian kinematics. Fundamental equations of nonsteady viscous flow. Characteristics and waves; initial and boundary conditions. Piston theory and the oscillating airfoil. Nonsteady flows with entropy production. Discontinuities, interactions, and special transients. Gasdynamics of nonsteady combustion. Analogies and applications. Prerequisite: ME 235 or ME 237 or equivalent. (Fall)

312 **Theory of Turbulence** (3)

Concept of turbulence, transition and linear theory of flow stability, experimental observations on turbulence generation, turbulent kinetic energy distribution, statistical description of turbulence, energy cascade and energy spectrum in turbulence, mean turbulent energy and Reynolds stress closure models, turbulent shear flows in free turbulence and wall

turbulence, turbulence in atmospherical environment and effects on air-pollution and weather systems, turbulent drag reduction. Prerequisite: ME 227. (Fall)

313 **Magnetofluidmechanics** (3)

Thermodynamics and fluid mechanics of electrically conducting liquids and gases; theory and applications; thermodynamics and transport properties of plasmas formulated; reaction kinetics and plasma reactions; fundamental equations (mass, momentum, and energy) of magnetofluidmechanics; flow with infinite and finite conductivity, Alfven waves and wave phenomena, flow with heat transfer and friction, relativistic magnetofluidmechanics, dimensional analysis and scaling parameters, applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221, 280. (As arranged)

315 **Hypersonic Flow** (3)

Small-disturbance theory, Newtonian theory; constant-density solution, theory of thin shock layers, flow over blunt bodies, hypersonic viscous flow. Prerequisite: ME 227. (Fall)

317 **Physical Gas Dynamics** (3)

Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235; and ME 295 or equivalent. (Spring)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Engineering Science Graduate Courses

201 **History of Technology I** (3)

The characteristic technologies of Prehistory, the Ancient Near East, Greece and Rome, Byzantium and Islam, and Christian Europe. Technology is broadly defined. Emphasis is on its manifold interactions with other cultural forces. (Fall)

*202 **Advanced General Metrology** (3)

Topics in the conceptual, physical, and mathematical aspects of measurement, standards, design for precision measurement, and measurement at extreme values. Prerequisite: graduate status. (Fall—evening)

*203–4 **Probability and Statistics of Metrology** (3–3)

Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin Square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent. (Academic year—evening)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

206 Technology and Human Needs (3)

Sociology of science and technology, the solar systems and earth, population, nonrenewable resources, renewable resources, energy, nuclear energy, renewable energy conversion, environment, productivity, transportation. Prerequisite: approval of Department. (Fall and spring)

207 Engineering Climatology (3)

Constitution of physical properties of earth and atmosphere, stability conditions, energy balance characteristics, atmospheric motions, storm forecasting models, tree-ring analysis, evaporation, precipitation, fog formation, soil moisture, ground frost. Prerequisite: approval of Department. (As arranged)

208 Energy Conservation (3)

Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, in industrial, manufacturing, and commercial sectors. Second law of thermodynamics from a conservation viewpoint. Construction methods for low-energy consumption in large and small edifices. Environmental effects and low-fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of Department. (As arranged)

210 Quantitative Aspects of Social Phenomena (3)

Mathematical models presenting social phenomena. Historical review of attempts to quantify social phenomena. Population growth, birth and death rates; population diffusion; Lancaster equation; Richardson's approach; the Forrester-Meadows model. Kinetic theory formulation of peaceful co-existence. Probability distributions, characteristic functions, and central limit theorem. Brownian motion approach to speculation and the stock market. Traffic flow, the statistical approach and Lighthill's method. Quality-of-life indicators and quantification of social indicators. Environmental modeling. Thermodynamics approach to self-rejuvenating systems and its application in government and organizations. Prerequisite: approval of Department. (As arranged)

212 Nonrenewable Resources (3)

Interplay of geology, engineering, and economics on resources. Role of resources in society, concepts and definitions for analyzing resource issues. Mineral commodities, their world distribution, geology, production technologies and costs, transportation systems, consumption patterns, substitutes, recycling. Environmental impacts, energy requirements, needs, and problems in mineral conservation; the threat of mineral cartels. Analysis of optimistic and pessimistic forecasts of future resource depletion. Prerequisite: approval of Department. (As arranged)

213 Renewable Resources (3)

Food and fiber, solar energy and radiation, photosynthesis. Agricultural and forest biomass production, seasonal availability, collection and replanting. Substitution of renewable resources for depletable. Food-energy relationship. Biological and chemical conversion processes, direct combustion, pyrolysis, enzymatic hydrolysis, and hydrogenation. Economics of scale and life cycle cost of conversion systems. Environmental and socio-economic impacts of alternative land usage. Institutional barriers. Prerequisite: approval of Department. (As arranged)

214 **Geothermal Energy** (3)

Geothermal energy due to thermal gradients in the earth, fundamentals of geological gradients, geographic location of potential geothermal energy sources, comparison of methods of exploration and study of steam and hot rock systems. Generation of electricity from geothermal sources. Obtaining hot water process heat. Equipment design. Environmental effects and means of mitigating adverse conditions. Prerequisite: approval of Department. (As arranged)

215 **Advanced Strength of Materials** (3)

Advanced problems of stress and strength analysis of structural and machine elements: bending, torsion and buckling of thin-walled structures. Curved beams, stress-concentrations, thermal stresses, creep instability and stress relaxation, contact problems, composite elements. Prerequisite: approval of Department. (Spring)

217 **Analytical Mechanics** (3)

Fundamental principles, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of Department. (Fall)

218 **Introduction to Continuum Mechanics** (3)

Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of Department. (Fall)

221 **Theory of Elasticity I** (3)

Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: approval of Department. (Spring)

222 **Theory of Elasticity II** (3)

Application of integral transforms and analytic function theory to solution of plane problems in static and dynamic elasticity. Introduction to three-dimensional elastostatics. Prerequisite: EngS 221, ApSc 211. (Fall, odd years)

228 **Physical Oceanography** (3)

Seawater, equations of motion, interaction between air and sea, currents, wind-waves in deep and shallow waters, long ocean waves, tides, wave-statistics, sea ice. Prerequisite: ME 221 or equivalent. (Spring)

229 **Transformations in Materials** (3)

Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: approval of Department. (Spring, odd years)

230 **Deformation of Materials** (3)

Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion hardening, mechanisms of creep, yield, and fracture. Prerequisite: approval of Department. (Fall, odd years)

231 **Structure of Materials** (3)

Space lattices, crystal structures, planes, directions, anisotropy, texture and preferred orientations, stereographic projections, Bragg's law, Laue

techniques, moving crystal diffraction, Debye-Scherrer method, X-ray spectrometry, electron microscopy, bonding energy of crystals, lattice energy, lattice vibrations, free electron theory, zone theory, alloy theories, conductors, insulators and semiconductors, magnetism, resistivity, defects in metals. Prerequisite: approval of Department. (Fall, even years)

233 Mechanics of Composite Materials (3)

Stress-strain relationship for orthotropic materials; invariant properties of an orthotropic lamina; biaxial strength theory for an orthotropic lamina; mechanics of materials approach to stiffness; elasticity approach to stiffness; classical lamination theory; strength of laminates; statistical theory of fatigue damage for composites. Prerequisite: approval of Department. (Spring, odd years)

234 Composite Materials (3)

Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing materials; structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of Department. (Spring, even years)

236 Experimental Techniques in Materials Science (3)

Sample preparation. Optical microscopy including polarized light methods, phase contrast, interferometry. X-ray microscopy including Laue technique and Debye-Scherrer method. Electron probe microanalysis. Electron microscopy including electron optics, image formation and contrast for scanning and transmission electron microscopy. Field ion microscopy. Prerequisite: approval of Department. (Spring, even years)

237 Environmental Effects on Materials (3)

Aqueous corrosion, electrochemistry, electrochemical reactions, polarization, environmental factors, integranular corrosion, stress corrosion, high temperature corrosion, kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of Department. (Fall, even years)

***239 Physical Ceramics** (3)

Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures; sintering vitrification, diffusional mechanisms and effects; reaction rate theory; elastic, anelastic, and plastic properties of ionic and covalent solids; viscoelastic behavior of vitreous and vitreous-solid systems; phase equilibria of ceramic systems. Prerequisite: approval of Department. (Spring)

240 Fracture Mechanics (3)

Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261. (Spring, even years)

241 Failure of Materials (3)

Tensile and shear deformation, yield, dislocation motion, geometry of slip, single and polycrystal deformation, twinning, creep deformation,

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

polymer deformation, fracture, Griffith Theory, fracture toughness, transition temperature, microstructure effects, environmental effects, stress corrosion cracking, cyclic stress and strain, fatigue crack initiation and propagation, statistical analysis, low cycle fatigue, failure analysis. (Fall, odd years)

242 **Materials Recycling and Recovery** (3)

Techniques and technologies for recovering and re-using waste materials and developing low-resource waste systems. Direct relationships of recycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and products; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of Department. (Spring)

*249 **Special Topics in Materials Science** (3)

Prerequisite: approval of Department. (As arranged)

251–52 **Transportation Workshop** (3–3)

Students and staff from various disciplines are brought together for study of a selected transportation topic, or for study of the land-use objectives and transportation needs of a selected urban area and a survey of pertinent information and applicable solutions. Prerequisite: approval of Department. (Academic year)

253 **Operational Control of Urban Transit Networks** (3)

General discussion of the essential functions of operation and control for various systems, with emphasis on the automation of these functions. Regulation of roadway traffic flow, management of public transit fleets, and automatic control of subways and of automated guideway transit systems. Prerequisite: approval of Department. (Spring)

256 **Introduction to the Theories of Inelastic Media** (3)

Physical basis of anelasticity, viscoelasticity, plasticity, and viscoplasticity; constitutive equations of elastic and viscoelastic media; foundations of the theories of plasticity and viscoplasticity; boundary-value problems and wave propagation in inelastic media. Prerequisite: ApSc 213 or equivalent and approval of Department. (Spring, odd years)

259 **Random Vibration of Structures** (3)

Introduction to random processes; responses of linear structures to stationary and nonstationary random inputs; structural responses to earthquakes, storm waves, boundary layer turbulences, wind loads, random temperature, etc.; failure analysis of structures under random loads; first passage failure, fatigue, stress-corrosion and crack propagation under random stress histories. Prerequisite: CE 252 or ME 215 or approval of Department. (Fall)

260 **Random Process Theory in Engineering** (3)

Spectral analysis, linear system, the superposition principle; statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values; statistical prediction of random vibration, application to civil and mechanical engineering. Prerequisite: ApSc 115 or equivalent. (Fall)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

***263 Atmospheric Physics for Engineers I** (3)
Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of Department. (As arranged)

***264 Atmospheric Physics for Engineers II** (3)
Atmospheric dynamics: mean structure of the atmosphere, temperature, pressure, and wind fields; mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation; micrometerology. Prerequisite: approval of Department. (As arranged)

270 Theoretical Acoustics I (3)
Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 221, ApSc 213, or equivalent. (As arranged)

***271 Random Process Theory I** (3)
Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of Department. (As arranged)

***272 Random Process Theory II** (3)
Discrete and continuous state Markov-processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in communication theory; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 271. (As arranged)

***273 Time Series Analysis** (3)
Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; coherence; modern techniques for spectral estimation including periodogram, Blackman-Tukey, direct filtering, maximum entropy, and maximum likelihood; fast Fourier transform and zoom FFT; effects of finite length and digitization on bias and variability; spectral analysis with randomly sampled data; digital filtering; applications in modern technology. Prerequisite: EngS 271 or approval of Department. (As arranged)

274 Environmental Noise Control (3)
Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise; automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

***275 Theoretical Acoustics II** (3)
General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radia-

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

tion from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270. (As arranged)

*276 **Acoustical and Mechanical Measurements** (3)

Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)

*277 **Physical Acoustics** (3)

Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

*278 **Psychological and Physiological Acoustics** (3)

Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of Department. (As arranged)

*279 **Human Factors in Engineering** (3)

Man-machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress. (Spring)

*280 **Special Topics in Acoustics** (3)

Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of Department. (As arranged)

*281 **Advanced Programming Techniques for Engineering Mechanics Problems** (3)

Techniques for efficient construction of large computer programs for engineering systems with emphasis on fundamental structured programming principles. Application to engineering mechanics systems such as finite elements and structural optimization. Effects of CPU organization and other hardware features of computer systems at NASA-Langley on numerical computations involved in engineering systems. Organization and management of data bases for large engineering mechanics systems. Prerequisite: approval of Department. (Spring)

282 **Computer-aided Design** (3)

Fundamental concepts in the development of computational algorithms for the design of structures, machine component and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote access computer terminals. General purpose computer programs for engineering analysis and design. Students, individually or in groups, are required to develop a small-scale general-purpose design program in an appropriate area such as structural design, machine design, urban planning, environ-

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

mental quality control, etc. Prerequisite: EE 51 or equivalent, and CE 210 or equivalent, and approval of Department. (Fall)

283 **Application of Computer Graphics in Engineering** (3)

Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points. Representation of two- and three-dimensional geometrical shapes by a set of discrete points. Automatic generation and display on CRT screen of geometrical shapes consisting of a grid of discrete points interconnected by user-selected geometric shapes. Automatic mesh generation, transformations, projections, and the concept of "hidden" lines. Use of remote computer terminals and graphic plotter equipment in interactive computer-graphics applications. Prerequisite: EE 51 or equivalent, and EngS 284 or equivalent. (Spring)

284 **Numerical Methods in Engineering** (3)

Uses of computers in engineering and science; numerical interpolation, integration and differentiation; least squares approximations and application to data fitting; roots of polynomials; eigenvalue and eigenvector problems; solution of systems of linear equations; ordinary differential equations; introduction to solution of partial differential equations; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of Department. (Fall)

285 **Finite Element Methods in Engineering Mechanics** (3)

Formulation of the finite element method through variational principles for structural and continuum mechanics problems. Plane stress, plane strain, three-dimensional elasticity, plate bending, thermal conduction, and potential flow. Techniques of constructing and assembling characteristic elemental matrices, computer implementation of the finite element method. Prerequisite: approval of Department. (Spring)

*286 **Analysis and Design of Thin-walled Structures** (3)

Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures; classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of Department. (As arranged)

*287 **Automated Design of Complex Structures** (3)

Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of Department. (As arranged)

288 **Advanced Finite Element Methods in Structural Mechanics** (3)

Formulation of various finite element models in solid mechanics. Examination of errors, convergence characteristics. Application to nonlinear and dynamic problems including large deflection, stability, and inelastic problems. Recent developments of finite element methods. Prerequisite: EngS 285. (As arranged)

289 **Special Topics in Theoretical and Applied Mechanics** (3)

Prerequisite: approval of Department. (As arranged)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

298 **Research** (arr.)

Basic research projects as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)

(Fall and spring)

*310 **Aeroacoustics** (3)

General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)

*311 **Nonlinear Acoustics** (3)

Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of Department. (As arranged)

*312 **Theory of Random Vibration** (3)

Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215. (As arranged)

*313 **Structural Acoustic Interaction** (3)

Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)

314 **Advanced Numerical Methods in Engineering** (3)

Advanced methods for numerical solution to engineering problems: finite difference solutions to elliptic, parabolic, and hyperbolic equations, method of characteristics, implicit and explicit initial value methods and their stability, optimization and mathematical programming methods, numerical solutions to integral equations, selected topics for fourth-generation computers. Prerequisite: EngS 284, ApSc 213. (Spring)

315 **Introduction to Nonlinear Mechanics of Continua** (3)

Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions; deformation, kinematics, stress, balance principles; principles for constitutive relations; applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212. (Spring)

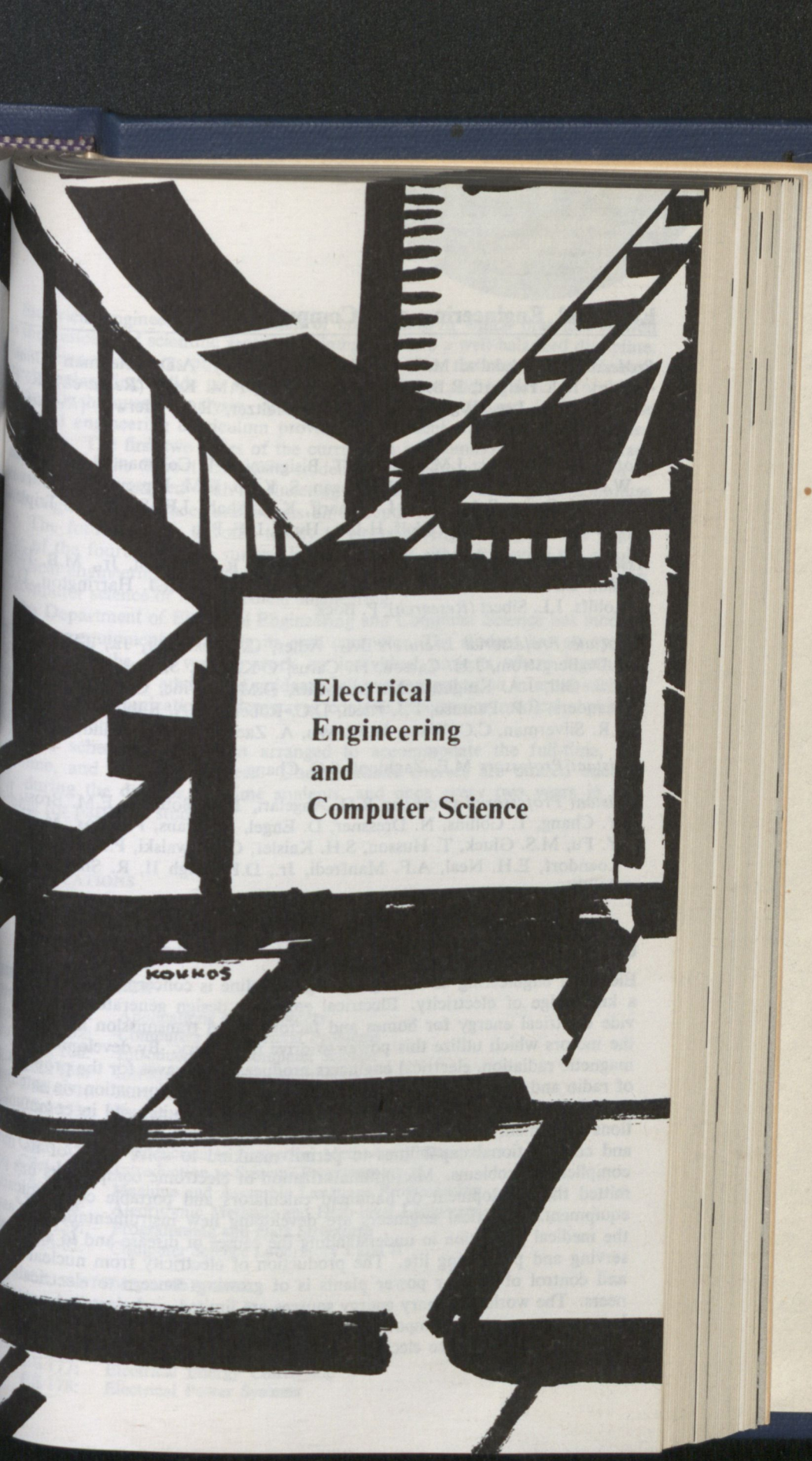
398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

*ffered at NASA-Langley Research Center; may be offered on campus when arranged.


Electrical
Engineering
and
Computer Science
KOUKOS

Electrical Engineering and Computer Science

Professors A. Abdalla, M.F. Eisenberg, J.D. Foley, A.D. Friedman *(Chairman)*, H.J. Helgert, R.B. Heller, W.K. Kahn, P.M. Kelly *(Research)*, R. H. Lang, T.N. Lee, W.D. Maurer, A.C. Meltzer, R.E. Merwin *(Research)*, R.L. Pickholtz

Professorial Lecturers J.M. Aein, W.T. Bisignani, J.T. Coleman, P.J. Crepeau, W.F. Croswell, G. Frenkel, D. Hogan, S. Karp, E.M. Lipsey, M.J. Marcus, T.P. McGarty, S.A. Musa, L. Scharff, K.R. Shah, J.E. Shore, R. Triplett, W. Wasylkiwskyj, A.A. Wolf, H-L.A. Hung, L.F. Pau

Associate Professors S. Berkovich, E.H. Braun, R.L. Carroll, Jr., M.B. Feldman, L.J. Hoffman, N. Kyriakopoulos, M.H. Loew, R.J. Harrington, D.C. Rohlfs, J.L. Sibert *(Research)*, P. Bock

Associate Professorial Lecturers J.G. Adler, C. Alexander, Jr., J.W. Benoit, P.D. Bergstrom, J.H. Carson, H. Carus, C-K. Cho, S. Das, C.E. Dunham, A.S. Gill, J.A. Knight, L.M. Leibowitz, D.M. LeVine, G.E. Lyon, C.F.H. Manders, F.P. Pantuso, F.J. Ricci, D.C. Roberts, L.A. Rubin, A. Schneider, J.R. Silverman, C.C. Wang, W.W. Wu, A. Zachai, R.M. Zeskind, A.J. Ziffer

Assistant Professors M.E. Zaghloul, S.C. Chang

Assistant Professorial Lecturers R.D. Angelari, T.M. Bottegal, F.M. Brosi, Jr., Y. Chang, T. Collins, N. Dressner, D. Engel, R. Evans, P.J. Fox, M. Fritts, Y. Fu, M.S. Gluck, T. Husson, S.H. Kaisler, G. Kowalski, P.A. Lamb, D.D. Loendorf, E.H. Neal, A.F. Manfredi, Jr., D.H. Pugh II, R. Shankar, D.R. Smith

UNDERGRADUATE STUDY

Electrical engineering as an engineering discipline is concerned with mastering a knowledge of electricity. Electrical engineers design generators, which provide electrical energy for homes and factories, and transmission networks and the motors which utilize this power to drive machinery. By developing electromagnetic radiation, electrical engineers produce radio waves for the propagation of radio and television signals and the transmission of information via satellites. Electrical engineers design and develop electronic circuits used in communications equipment and computers. These machines have enhanced our thinking and computational capabilities to permit mankind to solve some of its most complicated problems. Microminiaturization of electronic components has permitted the development of handheld calculators and portable communication equipment. Electrical engineers are developing new instrumentation to assist the medical profession in understanding the causes of disease and to aid in preserving and prolonging life. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engineers. The world's primary energy sources are limited, and electrical power has become an even more important resource. Electrical engineers are involved in the research to produce electrical energy directly from solar power.

Electrical engineering is a branch of engineering in which practical as well as theoretical and scientific aspects are integrated into a well-balanced discipline. Basic sciences such as physics and mathematics form the roots on which electrical engineering builds to create an applied science and to develop problem-solving techniques. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated approach. The first two years of the curriculum are common to all undergraduate fields in the School and allow students to develop a sound foundation of basic sciences coupled with engineering sciences. The third year continues with engineering sciences and begins an in-depth study of electrical engineering. The fourth year is devoted totally to electrical engineering. At the beginning of the fourth year the student has a choice of either following the regular electrical engineering curriculum or branching off into an area of concentration in computer science or in premedical engineering.

The Department of Electrical Engineering and Computer Science has modern laboratory equipment, including its own computer. The student has an opportunity during the last year to work on individual projects where ingenuity, coupled with faculty advice and guidance, allows concentration in areas such as computers, communications, microwaves, controls, electronics, medical engineering, and circuits.

Course schedules have been arranged to accommodate the full-time, the part-time, and the co-op student. Undergraduate courses are offered once a year during the day for full-time students, and once every two years in the evening for part-time students.

ubject Areas

OMMUNICATIONS

EE 143: Elements of Communication Engineering Design I
EE 144: Elements of Communication Engineering Design II
EE 146: Communications Laboratory

OMPUTER SCIENCE

CSci 51: Applications of Computers
CSci 52: Computers and Societal Problems
CSci 100: Introduction to Computer Science
CSci 150: Introduction to Microcomputers
CSci 151: Introduction to Systems Programming I
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Systems Programming II
CSci 157: Machine and Assembly Language Programming
CSci 158: Algorithmic Methods and High-level Languages
CSci 159: Programming and Data Structures
CSci 166-67: Computer Science Laboratory I and II

TROLS, SYSTEMS, AND POWER

EE 166: Power Systems Laboratory
EE 172: Control Systems Design
EE 176: Control Systems Laboratory
EE 177: Electrical Energy Conversion
EE 178: Electrical Power Systems

ELECTRONICS

EE 20:	Introductory Engineering Electronics
EE 121:	Engineering Electronics and Design
EE 122:	Pulse and Waveshaping Electronic Design
EE 124:	Electronic Devices
EE 169:	Advanced Electronics Design Laboratory

FIELDS AND WAVES

EE 31:	Fields and Waves I
EE 32:	Fields and Waves II
EE 133:	Electromagnetic Waves and Microwave Systems Design
*EE 168:	Microwave and Laser Engineering Laboratory

LABORATORIES AND MEASUREMENT

CSci 163:	Senior Electrical Engineering Project Laboratory I
CSci 164:	Senior Electrical Engineering Project Laboratory II
EE 63:	Instrumentation and Networks Laboratory
EE 65:	Introductory Electronics Laboratory
EE 66:	Digital Electronics Design Laboratory
EE 67:	Switching Circuits Laboratory
EE 163:	Senior Electrical Engineering Project Laboratory I
EE 164:	Senior Electrical Engineering Project Laboratory II

MEDICAL ENGINEERING

EE 184:	Medical Engineering Instrumentation and Systems Design
*EE 186:	Medical Engineering Laboratory

NETWORKS

EE 11:	Linear Networks I
EE 12:	Linear Networks II
EE 113:	Network Analysis and Design
EE 116:	Introduction to Network Synthesis

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

BiSc 11:	Introductory Biology for Science Majors (4) (Pre-Med only)
EE 51:	Applications of Computers (3)
†Math 30–31:	Precalculus and Single-Variable Calculus I (3)
or	
Math 31:	Single-Variable Calculus I (3)

* Effective fall semester 1981.

† Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

Phys 3: Foundations of Physics (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Second Semester

BiSc 12: Introductory Biology for Science Majors (4) (Pre-Med only)
EE 52: Computers and Societal Problems (3)
*Math 32: Single-Variable Calculus II (3)
*Math 33: Multivariate Calculus (3)
Phys 14: Introductory Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Chem 13: General Chemistry (4)
Phys 15: Elements of Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

Chem 22: Introductory Quantitative Analysis (3) (Pre-Med only)
ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

lectrical Engineering Curriculum

Fifth Semester

EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
EE 157: Machine and Assembly Language Programming (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse, Digital, and Waveshaping Electronic Design (3)
EE 177: Electrical Energy Conversion (3)
Elective: Selected from humanities or social sciences (3)

th 32 and Math 33 may be taken in a one-semester combined course, Math 32-33.

Seventh Semester

EE 121:	Engineering Electronics and Design (3)
EE 143:	Elements of Communication Engineering Design I (3)
*EE 161:	Electrical Engineering Laboratory (2)
†EE 163:	Senior Electrical Engineering Project Laboratory I (1)
Elective:	Technical electives (9) (three courses selected from EE 113, 133, 150, 155, 178; ME 131, 187)
†Elective:	Select one laboratory (1 credit) from CSci 166, EE 166, 168, and 169

Eighth Semester

EE 144:	Elements of Communication Engineering Design II (3)
*EE 162:	Electrical Engineering Laboratory (2)
†EE 164:	Senior Electrical Engineering Project Laboratory II (1)
EE 172:	Control Systems Design (3)
Elective:	Technical electives (5) (two courses selected from EE 116, 124, 160, 165, 184; ME 194)
†Elective:	Select one laboratory (1 credit) from EE 146, 176, 186, and CSci 167

Technical Electives

CSci 166–67:	Computer Science Laboratory I and II (1–1)
EE 113:	Network Analysis and Design (3)
EE 116:	Introduction to Network Synthesis (3)
EE 124:	Electronic Devices (3)
EE 133:	Electromagnetic Waves and Microwave Systems Design (3)
EE 146:	Communications Laboratory (1)
EE 150:	Introduction to Microcomputers (3)
EE 155:	Introduction to Numerical Methods for Computers (3)
EE 160:	Electrical Measurements and Instrumentation (3)
EE 165:	Senior Design Project (2)
EE 166:	Power Systems Laboratory (1)
EE 168:	Microwave and Laser Engineering Laboratory (1)
EE 169:	Advanced Electronics Design Laboratory (1)
EE 178:	Electrical Power Systems (3)
EE 184:	Medical Engineering Instrumentation and Systems Design (3)
EE 186:	Medical Engineering Laboratory (1)
ME 131:	Thermodynamics (3)
ME 187:	Heat Transfer Theory (3)
ME 194:	Energy Conversion (3)

Computer Science Option

Computer science is a developing discipline which combines electronic design, programming of computers, and mathematics into one comprehensive area. The student learns the design and utilization of computers for scientific and business applications. Students who complete this option will be able to design both hardware and software needed for minicomputer and large-scale com-

* Will not be offered after spring semester 1981.

† Effective fall semester 1981.

puting systems. The student will also be competent in hardware and software utilization of computers for control of large systems. The curriculum prepares the student for a career in computer design, applications, and utilization, or to continue study in graduate school.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 122–23.

Fifth Semester

CSci 157: Machine and Assembly Language Programming (3)
CSci 158: Algorithmic Methods and High Level Languages (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)

Sixth Semester

CSci 153: Design of Switching Systems (3)
CSci 159: Programming and Data Structures (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse and Waveshaping Electronic Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

CSci 150: Introduction to Microcomputers (3)
CSci 151: Introduction to Systems Programming I (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
*CSci 161: Computer Science Laboratory (2)
†CSci 163: Senior Computer Science Project Laboratory (1)
†CSci 166: Computer Science Laboratory I (1)
Elective: Technical elective (3) (one course selected from EE 113, 121, 133, 143; and one course selected from humanities or social sciences (3)

Eighth Semester

CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Systems Programming II (3)
*CSci 162: Computer Science Laboratory (2)
†CSci 164: Senior Computer Science Project Laboratory (1)
†CSci 167: Computer Science Laboratory II (1)
EE 172: Control Systems Design (3)
Elective: Technical elective (3) (one course selected from EE 124, 144, 165, 184)

*ill not be offered after spring semester 1981.
†ective fall semester 1981.

Technical Electives

CSci 177:	Programming for Management Systems (3)
CSci 178:	Introduction to Database Management (3)
EE 113:	Network Analysis and Design (3)
EE 121:	Engineering Electronics and Design (3)
EE 124:	Electronic Devices (3)
EE 133:	Electromagnetic Waves and Microwave Systems Design (3)
EE 143:	Elements of Communication Engineering Design I (3)
EE 144:	Elements of Communication Engineering Design II (3)
EE 165:	Senior Design Project (2)
EE 184:	Medical Engineering Instrumentation and Systems Design (3)

Premedical Engineering Option

The Premedical Engineering option will permit the student who completes the work to obtain a bachelor's degree in engineering and have sufficient preparation to apply to a medical school for work toward a doctor of medicine degree. The student will also have sufficient background to work in various allied health fields, in the research and development of new electronic equipment used in medicine, or to continue as a graduate student in engineering with exceptional qualifications for medical engineering.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 122–23.

Fifth Semester

Chem 151:	Organic Chemistry (3)
Chem 153:	Organic Chemistry Laboratory (1)
EE 12:	Linear Networks II (3)
EE 20:	Introductory Engineering Electronics (3)
EE 31:	Fields and Waves I (3)
EE 63:	Instrumentation and Networks Laboratory (1)
EE 65:	Introductory Electronics Laboratory (1)
EE 157:	Machine and Assembly Language Programming (3)

Sixth Semester

Chem 152:	Organic Chemistry (3)
Chem 154:	Organic Chemistry Laboratory (1)
CSci 153:	Design of Switching Systems (3)
EE 32:	Fields and Waves II (3)
EE 66:	Digital Electronics Design Laboratory (1)
EE 67:	Switching Circuits Laboratory (1)
EE 122:	Pulse and Waveshaping Electronic Design (3)
Elective:	Selected from humanities or social sciences (3)

Seventh Semester

EE 121:	Engineering Electronics and Design (3)
EE 143:	Elements of Communication Engineering Design I (3)
EE 161:	Electrical Engineering Laboratory (2)
*EE 163:	Senior Electrical Engineering Project Laboratory I (1)
*EE 169:	Advanced Electronics Design Laboratory (1)
Elective:	Selected from humanities or social sciences (6)
Elective:	Technical elective (3)

*Effective fall semester 1981.

Eighth Semester

*EE 162:	Electrical Engineering Laboratory (2)
†EE 164:	Senior Electrical Engineering Project Laboratory II (1)
EE 172:	Control Systems Design (3)
EE 184:	Medical Engineering and Systems Design (3)
†EE 186:	Medical Engineering Laboratory (1)
Elective:	Selected from humanities or social sciences (6)
Elective:	Technical elective (3)

Technical Electives

Bioc 221–22:	General Biochemistry (3–4)
BiSc 145:	Introduction to Vertebrate Embryology (4)
BiSc 148:	Histology (4)
EE 144:	Elements of Communication Engineering Design II (3)

Electrical Engineering Undergraduate Courses‡

11 Linear Networks I (3)

Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution, phasors and steady-state analysis, measurements, impedance concepts, resonance, and filtering. Prerequisite: Phys 15, ApSc 113. (Spring—day and evening; fall—evening) (Kyriakopoulos)

12 Linear Networks II (3)

Singular functions; Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra; frequency response, Bode plots; two-port parameters. Prerequisite: ApSc 114, EE 11. (Fall—day and evening; spring—evening) (Kyriakopoulos)

20 Introductory Engineering Electronics (3)

Various types of devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Solid-state, vacuum, and gaseous devices. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of graphical techniques. Prerequisite: EE 11. (Fall—day and evening; spring—evening) (Heller)

31 Fields and Waves I (3)

Vector calculus, orthogonal coordinates, Coulomb's and Gauss' laws, scalar potential, dipoles, method of images, dielectrics, capacitance, steady currents, Laplace's and Poisson's equations, boundary-value problems. Prerequisite: Phys 15, 16; ApSc 114. (Fall—day; fall, even years—evening) (Kahn)

32 Fields and Waves II (3)

Biot-Savart law, Ampere's law, vector potential, magnets, Faraday's law, Maxwell's equations, plane waves, and Poynting vector. Prerequisite: EE 31. (Spring—day; spring, odd years—evening) (Kahn)

not be offered after spring semester 1981.
ctive fall semester 1981.
faculty member whose name appears at the end of each course description is the director for ourse. The course director is not necessarily the instructor for any given semester.

51 **Applications of Computers** (3) (Same as CSci 51)

Introduction to the solution of problems on a digital computer using the FORTRAN or BASIC languages*; data processing concepts and numerical methods using batch or interactive time-shared terminal computer systems; writing, debugging, and running programs on various digital computer systems. Graduate students needing an introductory course in computers should enroll in EE/CSci 100. (Fall and spring—day and evening) (Feldman)

52 **Computers and Societal Problems** (3) (Same as CSci 52)

Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and file generation and access in time-shared and batch environments using FORTRAN or BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci or EE 51 or equivalent; two years of college preparatory mathematics. (Fall and spring—day and evening) (Bock)

63 **Instrumentation and Networks Laboratory** (1)

Use of standard laboratory electronic instruments in the measurement of electrical and electronic components and networks. Verification of network laws and theorems. Characteristics and limitations of instruments. Application of instruments to measure voltage, current, resistance, impedance, power, time, period, and frequency. Use of digital multimeter, frequency counter, function generator, and oscilloscope to measure steady-state and transient phenomena. Prerequisite or concurrent registration: EE 12, EE 20, and EE 31. (Fall—day and evening; Spring—evening) (Rohlfs)

65 **Solid-State Devices Laboratory** (1)

(Formerly Introductory Electronics Laboratory)

Testing and measurement of the characteristics of solid-state devices used in electronic systems: diodes, BJTs, FETs, SCRs, Timers, Op Amps, and ICs. Applications of the devices. Design and measurement of the characteristics of power supplies, BJT and FET amplifier circuits, clipping and clamping circuits, power control circuits, and timing circuits. Prerequisite or concurrent registration: EE 12, EE 20, EE 31, and EE 63. (Fall—day and evening; Spring—evening) (Rohlfs)

66 **Digital Electronics Design Laboratory** (1)

Characteristics of electronic devices used in switching, sweeping and waveforming circuits. Generation of waveforms. Digital storage devices and sequential circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Replaces former EE 61. Prerequisite or concurrent registration: EE 63, 65, 122. (Spring—day and evening; fall—evening) (Rohlfs)

67 **Switching Circuits Laboratory** (1)

Analysis and design of combinational and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, character generators and arithmetic circuits. Replaces former EE 61. Prerequisite or concurrent registration: EE 63, 65, 153. (Spring—day and evening; fall—evening) (Rohlfs)

* Specific sections of this course will emphasize one or the other language; check schedule of classes at the beginning of each semester. EE and CS majors must select a BASIC section.

100 **Introduction to Computer Science** (3) (Same as CSci 100)

A more intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN or BASIC language; data processing concepts, numerical and non-numerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Fall and spring—evening) (Feldman)

113 **Network Analysis and Design** (3)

Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer functions, properties of active networks including reciprocity, stability, activity, and feedback. Use of network analysis programs such as ECAP. Prerequisite: EE 12, 20. (Fall—day; fall, even years—evening) (Lee)

116 **Introduction to Network Synthesis** (3)

Network functions and their properties. Positive-real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port synthesis; the approximation problem in the frequency domain; modern filter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. (Spring—day; spring, odd years—evening) (Lee)

121 **Engineering Electronics and Design** (3)

Graphical analysis and design beyond the level covered in EE 20. Design of push-pull, direct-coupled and class B and C amplifiers. Design of operational amplifiers and their use in filters and electronic systems. Design of oscillators, active filters, modulators and demodulators. Design of power supplies. Prerequisite: EE 12, 20. (Fall—day and evening) (Heller)

122 **Pulse, Digital, and Waveshaping Electronic Design** (3)

Introduction to and design of large signal circuits used in computers and communications systems. Design of logic gates and flipflops. Concepts in integrated circuit design. Design of counting and timing circuits using IC's. Pulse, sweep and waveshaping circuits. Prerequisite: EE 12, 20. (Spring—day and evening) (Abdalla)

124 **Electronic Devices** (3)

Principles of operation of electronic devices used in electrical networks, communication systems, and electronic circuits. Properties of electronic devices and their applications. Modeling of devices such as diodes, transistors, and lasers. Fabrication methods of discrete components and integrated circuits. Prerequisite: EE 12, 32, 121, Phys 16. (Spring—day; spring, odd years—evening) (Heller)

33 **Electromagnetic Waves and Microwave Systems Design** (3)

Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities, Smith chart, design of coaxial and waveguide systems, Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32. (Fall—day; fall, even years—evening) (Kahn)

143 Elements of Communication Engineering Design I (3)

Signal analysis; Fourier transforms, power spectrum; principles of modulation, amplitude, frequency, and pulse modulation. Comparison of analog and digital transmission. Time and frequency division multiplexing. Random signals and noise. Transmission systems for cable, radio, satellite, and optical links. Prerequisite: EE 121, or concurrent registration; ApSc 114, or permission of instructor. (Fall—day and evening) (Helgert)

144 Elements of Communication Engineering Design II (3)

Statistical theory of communication. Comparison of communication systems in noisy channels. Data communications, design of modems. Concept of information theory. Coding for noisy channels. ARQ and forward error control. Communication protocols. Elements of traffic theory. Special topics and student project. Prerequisite: EE 143 or permission of instructor. May be taken for graduate credit by graduate students who are not majoring in communications. (Spring—day and evening) (Helgert)

146 Communications Laboratory (1)

Empirical study of several major topics in modern communications. Experiments are chosen from the areas of linear filters, random and pseudorandom processes, analog and digital communications, A/D conversion, source and channel coding, noise measurements, data security, and data networks. Prerequisite or concurrent registration: EE 12, 32, 63, 65, 121, 122, 143, 144, 153. (Spring—day and evening) (Helgert)

150 Introduction to Microcomputers (3) (Same as CSci 150)

Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmetic operations. Different microcomputer architectures. Prerequisite: CSci 153 or permission of instructor. (Fall—day and evening) (Friedman)

151 Introduction to Systems Programming I (3) (Same as CSci 151)

Concepts and use of macro-assemblers and conditional assembly. Control of I/O via access methods. Job control languages and file structures. File and storage management. Use of linkers and loaders to create load modules. Prerequisite: EE 157 and 159. (Fall—day; fall, odd years—evening) (Feldman)

153 Design of Switching Systems (3) (Same as CSci 153)

Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous and pulse sequential circuits. State-assignment and covers. May be taken for graduate credit by graduate students who are not majoring in computer science or computer heuristics, modeling, and numerical methods. (Spring—day and evening; fall—evening) (Friedman)

154 Digital Computer Design (3) (Same as CSci 154)

Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in

timing and control signals. Design of binary and decimal, serial and parallel digital arithmetic units. Design of memory subsystems, channels, I/O, and storage subsystems. Design of the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci or EE 153 or permission of instructor. May be taken for graduate credit. (Spring—day and evening; fall—evening) (Abdalla)

155 **Introduction to Numerical Methods for Computers** (3)
(Same as CSci 155)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci/EE 51; or equivalent. (Fall—day; fall, even years—evening) (Meltzer)

156 **Introduction to Systems Programming II** (3) (Same as CSci 156)

Concepts of an operating system, monitors, dispatchers, initiators and control programs. Control of task, job stream and secondary storage. Memory management, interrupt handling, device management and scheduling algorithms. Concurrent processes. Performance evaluation in a multi-programmed environment. Prerequisite: CSci 151. (Spring—day; spring, even years—evening) (Hoffman)

157 **Machine and Assembly Language Programming** (3)
(Same as CSci 157)

Programming of microcomputers, minicomputers, and large-scale computers in machine and assembly language. Number systems and codes. Architecture of various digital computers. Methods of addressing and machine control for fixed- and variable-word-length computers. Programming on a stack architecture computer. Input-output control. Timing and benchmarking techniques. Prerequisite: CSci/EE 51 or equivalent. May be taken for graduate credit by graduate students who are not majoring in computer science or computer heuristics, modeling, and numerical methods. (Fall—day and evening; spring—evening) (Bock)

158 **Algorithmic Methods and High-Level Languages** (3)
(Same as CSci 158)

Structure, application, and comparison of high-level programming languages. List structures. Recursive procedures. Structured programming. Top-down program design. Team-programming techniques. Meta-syntactical techniques. Introduction to parsing and compiling. String processing. Turing and Markov algorithms. Performance evaluation and benchmarking techniques. Prerequisite: CSci/EE 51. May be taken for graduate credit. (Fall—day and evening; spring—evening) (Bock)

159 **Programming and Data Structures** (3) (Same as CSci 159)

Discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures. Sorting, searching, hashing and merging of data files. List and string processing languages. Prerequisite: CSci 157, 158. May be taken for graduate credit. (Spring—day and evening) (Feldman)

160 Electrical Measurements and Instrumentation (3)

Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, inductance, energy, phase angle, frequency, and time. Measurements of high-frequency signals including field strength, signal-to-noise ratio, impedance, and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instrumentation. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 12, 32, 121, 150. (Spring—evening) (Heller)

***161–62 Electrical Engineering Laboratory** (2–2)

Experiments in support of courses in networks, electronics, microwaves, computers, communications, controls, and machines. The student is required to begin a design project in EE 161 and complete it in EE 162. Prerequisite or concurrent registration: EE 61, 113, 122; CSci/EE 150. EE 161 is prerequisite to EE 162. (Academic year—day and evening) (Meltzer)

†163 Senior Electrical Engineering Project Laboratory I (1)

The student will conceive and design a one-year project which will be completed in EE 164. As part of the project the student must perform a market survey and economic analysis of the product. The student will complete the preliminary design in this semester. Prerequisite or concurrent registration: EE 32, 63, 65, 122, 153, 177 and senior status. (Fall—day and evening) (Meltzer)

†164 Senior Electrical Engineering Laboratory II (1)

The student will complete and construct the project which was started in EE 163. The student will make both an oral and written presentation of the product designed. Prerequisite: EE 163. (Spring—day and evening) (Meltzer)

165 Senior Design Project (2)

The student will conceive, design, construct, and test an original project in hardware or software. A complete report will be written including, if applicable, schematic diagrams and repair procedures. This project cannot be used to satisfy the project required in EE 161–62. Prerequisite: senior status. (Spring—day) (Pickholtz)

†166 Power Systems Laboratory I (1)

Experiments in support of the analysis and design of electrical power systems. Measurements of the characteristics of newer devices to generate electricity. Fault analysis on electrical machines. Prerequisite or concurrent registration: EE 32, 177, 178. (Fall—day and evening) (Harrington)

†168 Microwave and Laser Engineering Laboratory (1)

Experiments in support of analysis and design of transmission lines, microwave components, microwave systems, fiber-optic systems, antennas and antenna arrays. Introduction to the characteristics of laser and optical systems. Prerequisite or concurrent registration: EE 63, 66, 133. (Fall—day and evening) (Kahn)

†169 Advanced Electronics Design Laboratory (1)

Experiments in support of the theory of the analog operation of electronic devices. Characteristics of nonlinear operation of electronic devices. Use

* Will not be offered after spring semester 1981.
† Effective fall semester 1981.

of electronic devices in communication equipment. Prerequisite or concurrent registration: EE 20, 63, 65, 121, 143. (Fall—day and evening) (Heller)

172 Control Systems Design (3)

Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114; and EE 12 or ME 134. (Spring—day and evening) (Kyriakopoulos)

***176 Control Systems Laboratory** (1)

Experiments in support of control theory. Characteristics of control components. Control components in feedback systems. Effects of nonlinearity on control systems. Prerequisite or concurrent registration: EE 12, 20, 63, 65, 113, 172. (Spring—day and evening) (Carroll)

177 Electrical Energy Conversion (3)

Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase a-c rotating machines, d-c machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Spring—day; spring, even years—evening) (Harrington)

178 Electrical Power Systems (3)

Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis by digital computer. Load-flow studies, economic considerations. Power station designs and synchronization of generators. Methods of generating electrical power. Prerequisite: EE 177, senior status. (Fall—evening) (Harrington)

179 Electrical Machine Control (3)

Torque and speed control requirements. Controlled rectifier characteristics. Dc and ac machine characteristics. Bridge rectifier and inverter. Inverter control of three-phase ac motor. Industrial applications. Prerequisite: EE 177. (Fall—day) (Harrington)

184 Medical Engineering Instrumentation and Systems Design (3)

Designed to introduce the engineering or physical sciences student to the applications of engineering design in the medical sciences; terminology of the medical profession emphasized; the physiology of the human body presented from overall systems or functional approach; survey of present-day medical measurements and consideration of those areas in which engineering design may be applied advantageously to medicine. May be taken for graduate credit except by medical engineering majors. (Spring—evening) (Eisenberg)

***186 Medical Engineering Laboratory** (1)

Experiments in support of instrumentation used in medicine and biology. Measurement of physiological signals, EKG, EEG, and evoked potentials. Processing of signals derived from physiological measurements. Concepts in telemetry of medical signals. Prerequisite or concurrent registration: EE 12, 32, 66, 121, 184. (Spring—day and evening) (Loew)

*Effective fall semester 1981.

198 **Research** (including Honors Research Seminar) (1 to 3)
Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

Computer Science Undergraduate Courses

30 **Introduction to Computing** (3)
An introductory course for students whose majors are not electrical engineering or computer science. Survey of computers and languages; communicating with a computer; introduction to the BASIC language; obtaining output from a computer; history of computing; positions in the computing industry; the effect of computers on our lives; uses for computers. Prerequisite: Algebra. (Fall and spring—day) (Hoffman)

51 **Applications of Computers** (3) (Same as EE 51)
Introduction to the solution of problems on a digital computer using FORTRAN or BASIC languages*; data processing concepts and numerical methods using batch or interactive time-shared terminal computer systems; writing, debugging, and running programs on various digital computer systems. Graduate students seeking a first course in computing should enroll in EE/CSci 100. (Fall and spring—day and evening) (Feldman)

52 **Computers and Societal Problems** (3) (Same as EE 52)
Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and file generation and access in time-shared and batch environments using FORTAN or BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci/EE 51 or equivalent; two years of college preparatory mathematics. (Fall and spring—day and evening) (Bock)

100 **Introduction to Computer Science** (3) (Same as EE 100)
A more intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN or BASIC language; data processing concepts, numerical and non-numerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Fall and spring—evening) (Feldman)

150 **Introduction to Microcomputers** (3) (Same as EE 150)
Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmetic operations. Different microcomputer archi-

* Specific sections of this course will emphasize one or the other language; check schedule of classes at the beginning of each semester. EE and CS majors must select a BASIC section.

tectures. Prerequisite: CSci 153 or permission of instructor. (Fall—day and evening) (Friedman)

151 Introduction to Systems Programming I (3) (Same as EE 151)

Concepts and use of marco-assemblers and conditional assembly. Control of I/O via access methods, Job control languages and files structures. File and storage management. Use of linkers and loaders to create load modules. Prerequisite: CSci 157, 159. (Fall—day; fall, odd years—evening) (Feldman)

153 Design of Switching Systems (3) (Same as EE 153)

Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous and pulse sequential circuits. State-assignment and covers. May be taken for graduate credit except by majors in computer science or computer heuristics, modeling, and numerical methods. (Spring—day and evening; fall—evening) (Friedman)

154 Digital Computer Design (3) (Same as EE 154)

Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in timing and control signals. Design of binary and decimal, serial and parallel digital arithmetic units. Design of memory subsystems, channels, I/O, and storage subsystems. Design of the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci 153 or permission of instructor. May be taken for graduate credit. (Spring—day and evening; fall—evening) (Abdalla)

155 Introduction to Numerical Methods for Computers (3) (Same as EE 155)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci or EE 51; or equivalent. (Fall—day; fall, even years—evening) (Meltzer)

156 Introduction to Systems Programming II (3) (Same as EE 156)

Concepts of an operating system, monitors, dispatchers, initiators and control programs. Control of task, job stream and secondary storage. Memory management, interrupt handling, device management and scheduling algorithms. Concurrent processes. Performance evaluation in a multi-programmed environment. Prerequisite: CSci 151. (Spring—day; spring, even years—evening) (Hoffman)

157 Machine and Assembly Language Programming (3) (Same as EE 157)

Programming of microcomputers, minicomputers, and large-scale computers in machine and assembly language. Number systems and codes. Architecture of various digital computers. Methods of addressing and

machine control for fixed- and variable-word-length computers. Programming on a stack architecture computer. Input-output control. Timing and benchmarking techniques. Prerequisite: CSci/EE 51 or equivalent. May be taken for graduate credit by graduate students who are not majoring in computer science or computer heuristics, modeling, and numerical methods. (Fall—day and evening; spring—evening) (Bock)

158 **Algorithmic Methods and High-Level Languages** (3) (Same as EE 158)

Structure, application, and comparison of high-level programming languages. List structures. Recursive procedures. Structured programming. Top-down program design. Team-programming techniques. Meta-syntactical techniques. Introduction to parsing and compiling. String processing. Turing and Markov algorithms. Performance evaluation and benchmarking techniques. Prerequisite: CSci/EE 51. May be taken for graduate credit. (Fall—day and evening; spring—evening) (Bock)

159 **Programming and Data Structures** (3) (Same as EE 159)

Discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures. Sorting, searching, hashing and merging of data files. List and string processing languages. Prerequisite: CSci/EE 157, 158. May be taken for graduate credit. (Spring—day and evening) (Feldman)

*161–62 **Computer Science Laboratory** (2–2)

Experiments in support of digital logic, electronics, systems and software. Use of integrated circuits and microprocessors to develop digital systems. Interfacing I/O equipment to computers. Analog computing, hybrid computing, and A-to-D converters. The student begins a design project in CSci 161 and completes it in CSci 162. CSci 161 is prerequisite to CSci 162. Prerequisite or concurrent registration: EE 61, 122; CSci 153, 157, 158. (Academic year—day and evening) (Meltzer)

†163 **Senior Computer Science Project Laboratory I** (1)

The student will conceive and design a one-year project in hardware and/or software which will be completed in CSci 164. As part of the project the student must perform a market survey and economic analysis of the product. The student will complete the preliminary design in this semester. Prerequisite or concurrent registration: EE 63, 65, 122, 153, 157, 158, 159 and senior status. (Fall—day and evening) (Abdalla)

†164 **Senior Computer Science Project Laboratory II** (1)

The student will complete and construct the project which was started in CSci 163. The student will make both an oral and written presentation of the product designed. Prerequisite: CSci 163. (Spring—day and evening) (Abdalla)

†166 **Computer Science Laboratory I** (1)

Experiments in support of the theory and design of micro-processor and microcomputer hardware and software. Use of microprocessors in control of systems. Use of simulators, cross-compilers and development systems. Prerequisite or concurrent registration: EE 63, 65, 66, 67, 122; CSci 150, 153, 157. (Fall—day and evening) (Abdalla)

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* Will not be offered after spring semester 1981.

† Effective fall semester 1981.

*167 **Computer Science Laboratory II** (1)

Experiments in support of the design of digital computing systems. Design of memory, control and arithmetic units. Input and output in a computer. Software experiments to support the operating system for a small computer. Prerequisite or concurrent registration: CSci 151, 154, 156, 157, 158, 159, 166; EE 66, 67. (Spring—day and evening) (Abdalla)

177 **Programming for Management Systems** (3)

An intermediate programming course with application in business and government commercial programming. Emphasis on programming for accounting and management information systems. Use of files editing, report generation, and tapes. The COBOL language will be utilized. Prerequisite: CSci 158. (Fall—evening) (Bock)

178 **Introduction to Database Management** (3)

Concepts in database systems; inverted file structure; query formulation and language; data structure to minimize access time; construction of a database management system; survey of some existing database management systems. Prerequisite: CSci 158 and 159. (Spring—evening) (Berkovich)

198 **Research** (including Honors Research Seminar) (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

GRADUATE STUDY

The Department of Electrical Engineering and Computer Science provides the
tudent who possesses a degree of maturity and basic knowledge one of the
ost stimulating experiences for advanced study. The Department offers study
ading to the Master of Science, Professional, and Doctor of Science degrees.
he student may study in an area of concentration such as Systems Science,
etworks, and Controls; Electrophysics (electronics, fields, and waves); Com-
unications; Medical Engineering; Computer Science (hardware, software, and
stems); Computer Heuristics, Modeling, and Numerical Methods; Energy
onversion, Power, and Transmission; or Telecommunications and Computers.

The graduate programs are formulated to take into consideration the stu-
nt's individual strengths, skills, aspirations, and abilities and are determined
rough consultation by the student with the faculty adviser. The program
ould provide the student with a thorough understanding of the area of con-
ntration and with a breadth of knowledge necessary in modern engineering
d computer science. Each graduate student is assigned a faculty adviser on
basis of study interests, helping to develop a close student-faculty relation-
p during the course of the program.

Colloquium Requirement: Graduate students are required to attend several
partment colloquia each semester. These are intended to broaden the stu-
t's professional outlook and to encourage interaction with the faculty.
edules are posted.

he graduate programs are also designed to provide an educational service
he Washington technical community. Many courses have been developed
r consultation with private industry and government agencies in the area.

ective fall semester 1981.

A substantial number are offered both during the afternoon and evening and alternate from year to year.

The Department of Electrical Engineering and Computer Science has continuously kept the graduate program up to date through contact with recent developments, research generated within the Department, and the addition of experts in appropriate fields who serve as part-time and adjunct faculty.

The Department of Electrical Engineering and Computer Science periodically publishes a detailed brochure to supplement the present catalogue with information about procedures, requirements, regulations, and scope of its graduate programs. Special pamphlets describing specific programs are also available.

Areas of Concentration

COMMUNICATIONS

EE 204:	Stochastic Signals and Noise
EE 205:	Stochastic Processes in Electrical Engineering
EE 208:	Digital Image Processing
EE 241:	Information Theory
EE 242:	Coding Theory
EE 243:	Communication Theory I
EE 244:	Communication Theory II
EE 245:	Signal Detection and Estimation Theory
EE 246:	Digital Communications
*EE 247:	Communication Systems
EE 248:	Data Communication Systems
EE 249:	Theory of Data- and Computer-Communication Networks
EE 252:	Digital Signal Processing Techniques
EE 253:	Sonar Systems
EE 254:	Radar Systems
EE 257:	Secure Communications
*EE 258:	Radio Communication Systems I
*EE 259:	Radio Communications Systems II
*EE 277:	Satellite Communication Systems
EE 298:	Research
EE 299–300:	Thesis Research
*EE 345:	Advanced Detection Theory
*EE 346:	Communications Switching and Traffic Theory
EE 347:	Data Communications
EE 349:	Communications Research
EE 399:	Dissertation Research

COMPUTER HEURISTICS, MODELING, AND NUMERICAL METHODS

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
CSci 201:	Introduction to Computer Systems
CSci 203:	Microprocessors and Microcomputers
CSci 213:	Discrete Structures in Computing
CSci 215:	Advanced Data Structures

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

CSci 219: Interactive Computer Graphics I
*CSci 220: Pattern Recognition
CSci 223: Simulation and Heuristics
CSci 224: Artificial Intelligence
CSci 231: Sequential Machines
*CSci 232: Automata and Formal Languages
CSci 278: Analog and Hybrid Computers
CSci 281: Applications of Numerical Methods I
CSci 282: Applications of Numerical Methods II
CSci 285: Approximation of Functions and Data Representations
*CSci 286: Numerical Methods in Engineering I
*CSci 287: Numerical Methods in Engineering II
*CSci 288: Numerical Methods in Engineering III
*CSci 289: Numerical Methods in Engineering IV
CSci 319: Interactive Computer Graphics II
CSci 399: Dissertation Research

COMPUTER SCIENCE (HARDWARE, SOFTWARE, AND SYSTEMS)

CSci 154: Digital Computer Design
CSci 158: Algorithmic Methods and High-Level Languages
CSci 159: Programming and Data Structures
CSci 201: Introduction to Computer Systems
CSci 203: Microprocessors and Microcomputers
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 215: Advanced Data Structures
CSci 216: Information Retrieval Systems
CSci 219: Interactive Computer Graphics I
*CSci 220: Pattern Recognition
CSci 222: Design of User-Computer Dialogues
CSci 223: Simulation and Heuristics
CSci 224: Artificial Intelligence
CSci 227: Management Information Systems and Data Base Management
CSci 229: Security and Privacy in Computer Systems
CSci 231: Sequential Machines
CSci 232: Automata and Formal Languages
CSci 237: Computing Systems
*CSci 239: Comparative Computer Systems
*CSci 240: Theory and Practice of Microprogramming
CSci 243: Fault Tolerant Systems and Design Automation
CSci 244: Data Communications
*CSci 245: Advanced Computer Systems Theory I
*CSci 246: Advanced Computer Systems Theory II
*CSci 255: Analysis and Correctness of Algorithms
*CSci 256: Design of Translators
*CSci 258: Advanced Programming Languages
CSci 263: Digital Computer Programming Systems
*CSci 267: Operating Systems I
*CSci 268: Operating Systems II
CSci 278: Analog and Hybrid Computers
CSci 298: Research
Sci 299–300: Thesis Research

octoral students must select a minimum of three courses designated with an asterisk as part of their ram in their major area.

*CSci 319: Interactive Computer Graphics II
CSci 391: Computer Science Research
CSci 399: Dissertation Research

ELECTROPHYSICS (ELECTRONICS, FIELDS, AND WAVES)

EE 201: Natural Modes and Transients in Electrical Systems
EE 206: Electromagnetic Theory and Applications I
EE 207: Electromagnetic Theory and Applications II
EE 221: Physical Electronics I
EE 222: Physical Electronics II
EE 223: Optical Communications Systems
*EE 224: Electronics of Lasers
EE 225: Nonlinear Electronics
*EE 226: Fiber and Integrated Optics
EE 227: Industrial Electronics
EE 228: High-frequency Electronics
EE 231: Field Analysis and Potential Theory
*EE 232: Electrodynamics
EE 233: Microwaves and Components
*EE 234: Electromagnetic Wave Propagation
EE 235: Antennas
*EE 236: Plasma Dynamics
*EE 237: Waves in Random Media
EE 238: Remote Sensing
EE 239: Numerical Laboratory in Electromagnetics
EE 255: Optical Processing
EE 298: Research
EE 299–300: Thesis Research
EE 321: Approximate Mathematical Techniques for Electromagnetics
EE 322: Advanced Waveguide Diffraction and Design
*EE 323: Principles of Microelectronics
EE 329: Electrophysics Research
EE 399: Dissertation Research

ENERGY CONVERSION, POWER, AND TRANSMISSION

EE 201: Natural Modes and Transients in Electrical Systems
EE 202: Linear System Theory I
EE 206: Electromagnetic Theory and Applications I
EE 212: Advanced Network Analysis
*EE 261: Electromechanical Energy Conversion
*EE 262: Control of Rotating Machinery
*EE 264: Direct Electrical Energy Conversion
EE 265: Electrical Power Production
EE 266: Electrical Power Transmission
EE 267: Power Networks
EE 268: Electrical Power Distribution
EE 269: Overall Electrical Power Generation Plant Design
EE 298: Research
EE 369: Issues in Electrical Power Systems
EE 399: Dissertation Research

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

MEDICAL ENGINEERING

EE 280: Introduction to Medicine for Engineers I: Physiology and Anatomy
EE 281: Introduction to Medicine for Engineers II: Physiology and Anatomy
EE 282: Medical Instrumentation I
EE 283: Medical Instrumentation II
EE 285: Sensory-evoked Potentials I
EE 287: Engineering in Physical Medicine and Rehabilitation
*EE 289: Clinical Engineering
EE 298: Research
EE 299–300: Thesis Research
*EE 380: Bioelectric Phenomena
*EE 381: Computer-aided Analysis of Physiological Signals
*EE 382: Physiological Controls and Systems
*EE 385: Sensory-evoked Potentials II
EE 389: Medical Engineering Research
EE 399: Dissertation Research

SYSTEMS SCIENCE, NETWORKS, AND CONTROLS

EE 201: Natural Modes and Transients in Electrical Systems
EE 202: Linear Systems Theory
EE 203: Graph Theory
EE 204: Stochastic Signals and Noise
EE 212: Network Analysis
*EE 213: Computer-aided Analysis and Design of Systems
EE 215: Network Synthesis
*EE 216: Synthesis of Active and Distributed Networks
*EE 217: Advanced Network Theory
*CSci 220: Pattern Recognition
*EE 271: Linear Multivariable Control Theory
EE 272: Computer Control Systems
EE 273: Systems Optimization
*EE 274: Nonlinear Systems
*EE 275: System Identification and Adaptive Control Systems
*EE 279: Stochastic Control Theory
EE 298: Research
EE 299–300: Thesis Research
EE 319: Systems Science, Networks, and Control Research
*EE 372: Analysis and Control of Large Systems
EE 399: Dissertation Research

LECOMMUNICATIONS AND COMPUTERS

EE 144: Elements of Communication Engineering Design II
EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 246: Digital Communications
EE 249: Data Telecommunications Networks I

toral students must select a minimum of three courses designated with an asterisk as part of their am in their major area.

EE 257:	Issues in Computer Communications
EE 346:	Communication Switching and Traffic Theory
EE 348:	Data Telecommunications Networks II
CSci 159:	Programming and Data Structures
CSci 201:	Introduction to Computer Systems
CSci 216:	Information Retrieval Systems
CSci 227:	Management Information Systems and Data Base Management
CSci 229:	Security and Privacy in Computer Systems
CSci 244:	Data Communications
CSci 263:	Digital Computer Programming Systems
CSci 267:	Operating Systems I
CSci 268:	Operating Systems II
EAd 211-12:	Engineering Administration
EAd 261:	Economic Analysis in Engineering Planning
EAd 262:	Finance for Engineers
EAd 269:	Elements of Decision-Making and Problem-Solving
EAd 281:	Systems Analysis and Management I
EAd 292:	Structural Analysis of Management Problems

MASTER OF SCIENCE DEGREE PROGRAM

The Department of Electrical Engineering and Computer Science offers graduate study leading to the degree of Master of Science in the following areas of concentration. Faculty members who may serve as advisers are listed after each area.

1. Communications (Braun, Chang, Helgert, Heller, Lang, Pickholtz)
2. Computer Heuristics, Modeling, and Numerical Methods (Abdalla, Bock, Feldman, Foley, Hoffman, Loew, Maurer, Meltzer, Zaghloul)
3. Computer Science (hardware, software, and systems) (Abdalla, Berkovich, Bock, Feldman, Foley, Friedman, Hoffman, Kyriakopoulos, Maurer, Meltzer, Merwin, Zaghloul)
4. Electrophysics (electronics, fields, and waves) (Braun, Eisenberg, Heller, Kahn, Lang)
5. Energy Conversion, Power, and Transmission (Harrington, Kahn, Lang, Meltzer)
6. Medical Engineering (Eisenberg, Loew)
7. Systems Science, Networks, and Controls (Carroll, Kyriakopoulos, Lee, Meltzer, Zaghloul)
8. Telecommunications and Computers (Helgert, Hoffman, Meltzer, Pickholtz; Shane, Steiner (Engineering Administration))

There are no required courses or programs of study in any of the areas of concentration. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the general requirements, the applicant must have satisfied admission to graduate study (see pages 27–28). Applicants for Master of Science programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements. The transfer of credit regulations (see page 28) apply as well to courses taken as a non-degree student through the Division of University and Summer Students at George Washington University.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science.

2. The applicant must have at least a quality-point index of 2.50 (on a scale with 4.00 maximum), or equivalent, for the last 60 semester hours of undergraduate work.

3. The applicant must be adequately prepared in the basic sciences (physics, and chemistry or biology) and in mathematics (four semesters beyond pre-calculus).

SPECIFIC REQUIREMENTS

In addition to the general requirements, the applicant must have satisfied through undergraduate studies the following specific requirements according to the area of concentration:

Communications

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)

2. Electronics (3 semester hours—EE 20; or equivalent)

3. Communication theory (3 semester hours—EE 143; or equivalent)

Computer Heuristics, Modeling, and Numerical Methods

1. Computer programming using FORTRAN (3 semester hours—CSci 51; or equivalent)

2. Mathematics including partial differential equations, matrices, and eigenvalue problems

3. Probability and statistics (3 semester hours—ApSc 115; or equivalent)

Computer Science

1. Computer programming using FORTRAN (3 semester hours—EE 51; or equivalent)

2. Computer hardware and computer software (6 semester hours—CSci 153 and CSci 157; or equivalent)

Electrophysics

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)

2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20 and 121; or equivalent)

3. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)

Energy Conversion, Power, and Transmission

1. Network analysis using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)

2. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)

3. Electrical energy conversion (3 semester hours—EE 177; or equivalent)

Medical Engineering

Either:

1. Network theory (3 semester hours—EE 11; or equivalent)
2. Electronic circuits (6 semester hours—EE 20 and 121; or equivalent)

Or:

1. Computer programming (3 semester hours—CSci 51; or equivalent)
2. Computer hardware and software (6 semester hours—CSci 153 and 157; or equivalent)

Systems Science, Networks, and Controls

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, and 113; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Control theory (3 semester hours—EE 172; or equivalent)

Telecommunications and Computers

1. Communication theory (3 semester hours—EE 143; or equivalent)
2. Computer Science (6 semester hours—CSci 51 and either CSci 150 or CSci 157; or equivalent)

In cases where some undergraduate deficiencies exist, the student may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified student to complete a specified undergraduate program before being admitted as a graduate student.

Program of Study

Upon admission to the Master of Science degree program, the graduate student is assigned a faculty adviser. In consultation, the student and faculty adviser formulate the program of study and complete the form "Graduate Program of Studies" (Form 1) for submission to the Department Chairman for approval. This form should be completed prior to or at the student's first registration. During consultation, the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree will consist of a minimum of 24 semester credit hours of graduate-level courses and 6 semester hours of thesis; or, for the nonthesis option, a minimum of 33 credit hours of graduate-level courses. With the thesis, a minimum of 12 credit hours must be in the major field of concentration, and no less than three graduate courses must be in areas other than the student's area of concentration (major). For the nonthesis option, a minimum of 21 credit hours must be in the major field, and no less than three courses must be in areas other than the student's major area.

A maximum of three courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

Master's Comprehensive Examination

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year. On the prescribed form, and prior to the deadline, students must notify the Department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day, and the student is asked to solve several problems relating to the subject matter of his major area of study. The student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is not limited to those specific courses which the student has taken, but is designed to demonstrate the student's ability to integrate material from several course areas as well as to learn from the readings.

A student who fails the Master's Comprehensive Examination on the first attempt may, in exceptional circumstances, be re-examined one more time if approval is given by the appropriate examining committee and the department. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

PROFESSIONAL DEGREE PROGRAM

The Department of Electrical Engineering and Computer Science offers graduate study leading to a Professional degree. This program is for students who are interested in pursuing course work beyond the Master's degree with emphasis on applied subject material rather than on research. Successful completion of the Professional degree program leads to the degrees of Engineer or Applied Scientist. Students may study for the Professional degree in the following areas of concentration. Communications; Computer Science (hardware, software, and systems); Electrophysics (electronics, fields, and waves); Medical Engineering; Systems Science, Networks, and Controls; Energy Conversion, Power, and Transmission; and Computer Heuristics, Modeling, and Numerical Methods.

There are no formal required courses or programs of study in any of the areas of concentration for the Professional degree. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward a Professional degree (see pages 32–33), applicants for the Professional degree programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science.

2. The applicant must have a quality-point index of at least 3.0 (on a scale of 4.0 maximum), and two years of professional experience after obtaining the Master's degree.

3. The applicant must be adequately prepared in the basic sciences (physics and chemistry or biology) and in mathematics (calculus through differential equations).

SPECIFIC REQUIREMENTS

In addition to the general requirements, the applicant must have satisfied through previous studies the following specific requirements according to the area of concentration:

Communications

Nine semester hours of statistical theory of communication and 3 semester hours of information theory—EE 204, 241, 243, and 244; or equivalent.

Computer Heuristics, Modeling, and Numerical Methods

Twelve semester hours of computer science and numerical methods at the graduate level—CSci 201, 223, and 281; or equivalent.

Computer Science

Twelve semester hours of computer system design and software beyond the use of a compiler language—CSci 154, 159, 201, and 213; or equivalent.

Electrophysics

Twelve semester hours of physical electronics, and electromagnetics at the graduate level—EE 201, 206, 207, and 221; or equivalent.

Energy Conversion, Power, and Transmission

Twelve semester hours of electrical machine theory and networks at the graduate level—EE 261, 262, 264, and 266; or equivalent.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 280, 281, 282 and 283; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours of network system analysis at the graduate level, including a knowledge of state space and linear graph theory—EE 202, 204, 272, and 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study which is increased beyond the minimum requirements so that sufficient background material may be covered.

Program of Study

Upon admission to the Professional degree program, the student is assigned a faculty adviser. Together they will formulate a program of study for the student which must contain a minimum of 30 semester hours of courses, and complete the form "Graduate Program of Study." Programs of study and any

subsequent changes must be approved by both the faculty adviser and the Department Chairman.

The program of study for the Professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a minimum of 18 semester hours of graduate-level courses in the major area of concentration and a minimum of 9 additional semester hours of graduate-level courses outside the major area but in support of the student's program. A student who is changing the major area from that studied for the Master's degree or who is lacking the specific requirements needed for admission may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

DOCTOR OF SCIENCE PROGRAM

The Department of Electrical Engineering and Computer Science offers programs of graduate study leading to the degree of Doctor of Science in the areas of concentration listed below. There are no formal required courses or programs of study in the areas listed. Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser.

Special fields of each faculty member are listed below.

ABDALLA, A.—Professor of Engineering and Applied Science.
Digital Computer Systems; Time-sharing Systems; Logical Design of Switching Circuits; Microprocessors.

BERKOVICH, S.—Associate Professor of Engineering and Applied Science.
Information Systems; Data Structures; Associative Memories and Processors.

BOCK, P.—Special Lecturer in Engineering.
Computer Science; Simulation; Programming Languages; Microprocessor Systems.

BRAUN, E.H.—Associate Professor of Engineering and Applied Science.
Antenna Theory; Coding Theory; Physical Electronics.

CARROLL, R.L.—Associate Professor of Engineering and Applied Science.
Control Theory; Adaptive Systems.

CHANG, S-C.—Assistant Professor of Engineering.
Error Correcting Codes; Logic Design; Communication Theory and Systems.

EISENBERG, M.F.—Professor of Engineering and Applied Science.
Medical Engineering; Thermography; Evoked Response; Ultrasonics.

FELDMAN, M.B.—Associate Professor of Engineering and Applied Science.
Computer Science, Programming Languages; Data Structures; Information Display Systems; Computer Graphics; Automata Theory.

FOLEY, J.D.—Associate Professor of Engineering and Applied Science.
Interactive Computer Graphics; System Modeling and Measurement; Human Factors of the Man-Machine Interface; Distributed Processing and Networking.

FRIEDMAN, A.D.—Professor of Engineering and Applied Science.
Computer Architecture and Organization; Switching Theory and Logic Design; Microprocessors; Diagnosis and Fault Tolerant Design of Digital Circuits; Digital System Design Automation.

HARRINGTON, R.J.—Associate Professor of Engineering.
Simulation and Control of Electrical Machinery and Power Systems; Transient Stability; Transmission Line Switching Transients; Computer Modeling.

HELGERT, H.—Professor of Engineering and Applied Science.
Communication and Information Theory; Coding Theory.

HELLER, R.B.—Professor of Engineering and Applied Science.
Information Processing; Computer-to-Computer Communication Networks; Satellite Communications; Electromagnetic Radiation.

HOFFMAN, L.J.—Associate Professor of Engineering and Applied Science.
Computer Science; Security and Privacy; Criminal Justice Information Systems; Social Implications.

KAHN, W.K.—Professor of Engineering and Applied Science.
Antennas; Microwave Components; Fiber Optics; Electrophysics.

KING, W.—Senior Scientist.
Signal Processing; Applications to Radar.

KYRIAKOPOULOS, N.—Associate Professor of Engineering and Applied Science.
Computer-Aided Network Design; System Theory; Control Theory; Digital Filtering.

LANG, R.H.—Professor of Engineering and Applied Science.
Wave Propagation in Random Media; Remote Sensing; Phase-Locked Loops; Adaptive Arrays.

LEE, T.N.—Associate Professor of Engineering and Applied Science.
Networks; Linear Systems.

LOEW, M.H.—Associate Professor of Engineering.
Pattern Recognition; Medical Engineering; Signal Processing.

MAURER, W.D.—Professor of Engineering and Applied Science.
Computer Science, Correctness of Programs, Analysis of Algorithms; Semantics of Programming Languages.

MELTZER, A.C.—Professor of Engineering and Applied Science.
Design of Computer Systems; Data Base Systems; Multiprocessor Systems; Hybrid Computation.

MERWIN, R.E.—Research Professor.
Microprogramming; Special-Purpose Computer Languages; Automatic Test Systems; Distributed Data Processing Systems.

PICKHOLTZ, R.L.—Professor of Engineering and Applied Science.
Data Communications, Computer Communications Networks; Communications Theory.

ROHLFS, D.C.—Associate Professor of Engineering.
Specialized Measurements and Instrumentation; Electronic Devices; High-Power HF Systems.

ZAGHLOUL, M.—Assistant Professor of Engineering.
Linear and Nonlinear Networks and Systems; Computer-Aided Network Analysis and Design; Computer Science; Programming Languages; Analysis of Algorithms.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward the Doctor of Science degree (see pages 34–35), applicants for the Doctor of Science degree in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science.
2. The applicant must have a minimum quality-point index of 3.20 (on a scale of 4.00 maximum), or equivalent, in graduate course work leading to the Master's degree.
3. The applicant must be adequately prepared in the basic sciences (physics, and chemistry or biology) and in mathematics (calculus through differential equations).

SPECIFIC REQUIREMENTS

In addition to the above general requirements, the applicant must also satisfy through previous studies the following specific requirements according to the area of concentration (major area):

Communications

Nine semester hours of statistical theory of communication and 3 semester hours of information theory—EE 204, 241, 243, and 244; or equivalent.

Computer Heuristics, Modeling, and Numerical Methods

Twelve semester hours of numerical methods at the graduate level—CSci 201, 223, and 281; or equivalent.

Computer Science

Twelve semester hours of computer system design and software beyond the use of a compiler language—CSci 154, 159, 201, and 213; or equivalent.

Electrophysics

Twelve semester hours of electronics and electromagnetic fields and waves at the graduate level—EE 201, 206, 207, and 221; or equivalent.

Energy Conversion, Power, and Transmission

Twelve semester hours of electrical machines theory and networks at the graduate level—EE 261, 262, 264, and 266.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 280, 281, 282, and 283; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours in network system analysis at the graduate level, including a knowledge of state space and linear graph theory—EE 202, 204, 272, and 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study which is increased beyond the minimum requirements so that sufficient background material may be covered for doctoral studies.

Program of Study

At the time of admission, the graduate student in pursuit of a Doctor of Science degree in the Department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser, the student will determine the two minor areas of study and the foreign language important in the student's field of study. Together they will formulate a program of study for the student leading to the Qualifying Examination and complete the form "Graduate Program of Study" (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and Department Chairman.

MAJOR AREA

The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas totaling a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the Master's degree level. A minimum of 15 semester hours must be taken in the major area; a minimum of three courses designated with an asterisk in the list of areas of concentration must be included as part of the major area. A student who is changing the major area from that studied for the Master's degree or who is missing specific admission requirements may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

MINOR AREAS

The student in consultation with the faculty adviser formulates a program of study which includes two minor areas as part of the total doctoral studies. For those students who take their minor area studies within the Department of Electrical Engineering and Computer Science, the following courses specify adequate programs in each minor area:

Communications—EE 204; 205 or 241; 243; and 244 or 249

Computer Heuristics, Modeling and Numerical Methods—CSci 201, 223, and 281

Computer Science—CSci 201, 213, and 237 or 263

Electrophysics—EE 201, 206, 207, and 221

Energy Conversion, Power, and Transmission—EE 261, 262, 264, and 266

Medical Engineering—EE 280, 281, 282, and 283

Systems Science, Networks, and Controls—EE 202, 203, 212, and 273

Minor areas are not confined to the Department of Electrical Engineering and Computer Science, but may be taken from other departments within the University such as Mathematics, Statistics, Operations Research, and Physics. Normally a minimum of three graduate-level courses constitutes a minor area.

QUALIFYING EXAMINATION

The Qualifying Examination for doctoral students in the Department is composed of two parts. All incoming doctoral students must take the first examination within three regular semesters of the date of formal admission into the doctoral program. Students entering as unclassified students with prescribed deficiencies must take the first examination within five semesters of their entrance as unclassified students. This first examination is the Department's Master's Comprehensive Examination (MCE) in the major area. The student must demonstrate superior performance to qualify formally as a student in the Department at the doctoral level. The requirement to take this first examination is waived for a student who has received an M.S. degree from this department and, within two years prior to entrance, has demonstrated superior performance on the MCE. A student who fails to demonstrate superior performance must take the examination again in one of the two immediately succeeding semesters. A student may take the MCE only two times. Failure to show superior performance on the MCE in the major field twice will result in termination of the student's candidacy.

Upon completion of the student's formal program of study and after demonstrating superior performance on the MCE and passing the foreign language examination, the student is prepared to complete the Qualifying Examination. The purpose of this second part of the Qualifying Examination is to ascertain that the student's depth and breadth of background and intellectual development are adequate to support doctoral research and investigation in the major area. After the 1980–81 academic year, the second part of the Qualifying Examination will be given only in the spring semesters.

This second portion of the Qualifying Examination is composed of a written part covering the major area (one day) and each minor area (one day each). In addition and subsequent to the written examination, there may be an oral examination. The student must pass the entire second part of the Qualifying Examination. A candidate who fails any portion of the Examination on the first attempt may take those portions of the Examination one more time if approval is given by the appropriate examining committee. Failure to pass the Qualifying Examination will terminate the student's candidacy in the doctoral program.

The questions on the Qualifying Examination are not limited to those specific areas in which the student has taken course work, but are designed to demonstrate the student's ability to integrate the material from several course areas as well as from individual study and readings. Hence, the student should be familiar with the contemporary work of the current journals and the contents of the books on the particular reading lists in the areas of examination as well as those used in the course work.

SSERTATION

After successfully completing the Qualifying Examination, the student makes rangements for the assignment of a research director (not necessarily the udent's faculty advisor), who selects an appropriate advisory committee. The ties of the advisory committee are to be aware of the student's dissertation velopment and, in conjunction with the research director, to give guidance

to the student. After the student completes his dissertation, the advisory committee will become the examining committee with the addition of at least one new person. The dissertation should be of such quality that all or part is suitable for publication in the open literature. Doctoral students are encouraged to publish their work.

Electrical Engineering Graduate Courses*

201 Natural Modes and Transients in Electrical Systems (3)

Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, Z-transforms; applications. Prerequisite: graduate status. (Fall and spring—evening) (Heller)

202 Linear Systems Theory (3)

An introduction to linear systems theory. Topics include linear vector spaces and linear operators, mathematical representation of dynamic linear systems, concept of state and solution of the state equation, controllability and observability, canonical forms of the state equation, state feedback, and state estimation. (Spring and fall) (Kyriakopoulos)

203 Graph Theory and Applications (3)
(Formerly Linear System Theory II)

An introduction to oriented and nonoriented graphs. Topics may include graph theory applications to the routing problems of multiple printed circuits; circuit concepts of linear vector spaces; network analysis and synthesis, topological formulas; and the theory of switching, such as logic networks, paths, reachability, connectedness, tree representations, transportation flows, and communication networks. Computer science applications such as storage representation and manipulation of computer data, PERT, and other related techniques. (Spring, even years) (Zaghloul)

204 Stochastic Signals and Noise (3)

Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. Prerequisite: ApSci 115 or equivalent. (Fall and spring—day and evening) (Lang)

205 Stochastic Processes in Electrical Engineering (3)

Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth-death process, applications to queuing theory, buffer problems, and the design of communication nets. Continuous state processes, diffusion processes, passage times, and estimation problems. Estimation and power spectra. Stochastic difference and differential equations. Applications to communication theory, control theory, computer science, and propagation theory of random media. Prerequisite: ApSci 115 or equivalent. (Spring—evening) (Lang)

206 Electromagnetic Theory and Applications I (3)

Brief review of vector-phasors and Maxwell's equations, electromagnetic

* The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

potentials, power and energy; plane waves, frustrated total reflection, skin effect, anisotropic media; solution of radiation problems in the Kirchoff approximation; elementary applications. Prerequisite: EE 133 or equivalent. (Fall—evening) (Lang)

207 Electromagnetic Theory and Applications II (3)

Introduction to advanced techniques for problems in electromagnetics; leaky waves and complex wave-types, stationary phase and steepest descent approximations for integrals in the complex plane. Discrete and continuous spectra. Application to optical fibers, surface and leaky wave antennas, ground wave propagation. Prerequisite: EE 201 or equivalent, EE 206. (Spring—evening) (Lang)

208 Digital Image Processing (3)

Properties of images and visual systems. Picture description, sampling and quantization. One- and two-dimensional image transform techniques including Fourier, Cosine and Hadamard. Methods of image enhancement and restoration. Image coding and data compression techniques. Automated image analysis and recognition. Prerequisite: EE 204. (Spring—evening) (Loew)

212 Network Analysis (3)

(Formerly Advanced Network Analysis)

Network theorems, network functions, network properties, relationship of parts of network functions, realizability and causality concepts. Introduction to the theory of nonlinear networks, nonlinear resistive network equation formulation, hybrid and other nonlinear equations. Nonlinear dynamic network equation formulation, state space, conditions for existence. Concepts of stability in nonlinear networks, conservative and Lagrangian networks and systems. (Fall, odd years) (Kyriakopoulos)

213 Computer-aided Analysis and Design of Systems (3)

(Formerly Computer-aided Analysis and Design of Networks)

Numerical solution of algebraic set of equations, Newton-Raphson and modified Newton-Raphson techniques, solution of algebraic equations with multiple solutions. Numerical solution of nonlinear ordinary differential equations, stability, stiff systems, steady state solution of nonlinear periodically excited networks, computer-aided approach. Numerical optimization techniques, linear and nonlinear programming, gradient methods, unconstrained optimization, quasi-Newton methods, and penalty functions. Computer-aided sensitivity analysis of networks. Application in the design of large systems and in automated design. Prerequisite: EE 203, EE 212, or EE 273. (Fall, odd years) (Zaghloul)

215 Linear Network Synthesis I (3)

Properties and testing of positive real functions. Synthesis of LC, RL, RC one-port networks. Brune, Bott-Duffin, Miyata, Kuh, and Darlington synthesis techniques. Introduction to two-port ladder and lattice synthesis. Three-terminal RC network synthesis approximation in the frequency and time domains. Prerequisite: EE 202 or permission of instructor. (Spring, odd years—evening) (Lee)

216 Synthesis of Active and Distributed Networks (3)

(Formerly Linear Network Synthesis II)

Active network synthesis using negative resistors, control sources, NIC, operator and operational amplifiers. Uniform and nonuniform distributed network analysis and synthesis—computer-aided design. Prerequisite: EE 215. (Fall, even years) (Lee)

217 Advanced Network Theory (3)

Modern methods for formulating network equations; mixed nodal tableau, state space formulation. Mathematical methods for the solution of network equations, properties of nonlinear functions representing the nonlinear networks, losslessness and passivity in nonlinear networks, *n*-port networks. Piecewise linear networks analysis and techniques. Properties of nonlinear dynamic equations; existence and uniqueness of solution; stability and stability classification; Popov, Liapunov, steady state analysis techniques of nonlinear periodic networks. Other selected topics. Prerequisite: EE 202, 212. (Spring, odd years) (Zaghloul)

221 Physical Electronics I (3)

Theoretical principles underlying the operation of electronic devices; classical mechanics and classical statistical mechanics, the quantum theory, wave and matrix mechanics, quantum statistics. Prerequisite: EE 207 or equivalent. (Fall—evening) (Braun)

222 Physical Electronics II (3)

The Boltzmann transport equation, band theory of solids, time-dependent perturbation theory, group theory. Applications to semiconductor and other solid-state devices such as transistors, tunnel diodes, masers, and lasers. Prerequisite: EE 221. (Spring—evening) (Braun)

223 Optical Communications Systems (3)

Optical communication channels; survey of laser sources; modulation; line-of-sight links; system models and analysis; detection, photoemitters, photodiodes, and photoconductors; noise mechanisms and signal-to-noise analysis; optical fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optic fiber cabling, repeaters, and systems analysis; integrated optic components. Prerequisite: EE 207, 243. (Spring, even years—evening) (Kahn)

224 Electronics of Lasers (3)

Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers; injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 or equivalent. (Fall, 1981 and every third year thereafter—evening) (Kahn)

225 Nonlinear Electronics (3)

Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators; study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators, Prerequisite: EE 201 or equivalent. (Fall, even years—evening) (Heller)

226 Fiber and Integrated Optics (3)

Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos-Haenchen shift, Hamiltonian formalism; directional couplers, modulators, and deflectors in fibers and surface films; coupled-mode theory. Prerequisite: EE 223 or equivalent. (Spring, odd years—evening) (Kahn)

227 Industrial Electronics (3)

Applications of electronic devices in industry; continuous and sampled control systems; induction and dielectric heating; timing and counting

circuits; reliability and automatic checking equipment; digital control of machine tools. Prerequisite: EE 201 or equivalent; and graduate status. (Spring, odd years—evening) (Heller)

228 **High-frequency Electronics** (3)

Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communication systems. Prerequisite: EE 207 or equivalent. (Spring—evening) (Heller)

231 **Field Analysis and Potential Theory** (3)

General study of the theory of potentials as used to facilitate solution of problems in electromagnetic theory, mechanics, thermodynamics, optics, and gravitation. Emphasis on mathematical methods such as Green's functions, variational methods, principal axis transformations, and multi-dimensional. Fourier transforms. Prerequisite: EE 207. (Spring, 1981 and every third year thereafter—evening) (Heller)

232 **Electrodynamics** (3)

Special theory of relativity and the Lorentz transformation; Minkowski formulation. Maxwell's equations in the context of special relativity, electromagnetic potentials, and stress tensors. Lagrangian and Hamiltonian formulations, radiation from moving charges. Introduction to quantum electrodynamics. Prerequisite: EE 207. (Spring, even years—evening) (Braun)

233 **Microwaves and Components** (3)

High-frequency transmission lines and guided systems; matching techniques; scattering parameters; transfer parameters; directional couplers; cavity resonators; Faraday rotation; ferrite isolators and circulators. Prerequisite: EE 207. (Fall—evening) (Kahn)

234 **Electromagnetic Wave Propagation** (3)

Retarded time scalar, vector, and Hertz potential. Dipole and dipole array fields; Mie theory of electromagnetic scattering by spheres. Propagation in electrically and magnetically anisotropic media such as dielectric crystals, space-charge plasmas, and ferrites. Wave propagation in inhomogeneous media; Liouville transformation, Lagrange's variation of parameters, WKB solution, invariant imbedding techniques. Propagation in stochastic and dispersive media. Prerequisite: EE 207. (Fall, even years—evening) (Lang)

235 **Antennas** (3)

General solution of Maxwell's equations in terms of current sources, polarization, the far field approximations, radiation from current distributions, field equivalence theorems, the geometrical optics approximation, aperture antennas, receiving antennas, the theory of arrays, and applications to specific antennas and antenna types. Prerequisite: EE 207. (Spring, odd years—evening) (Kahn)

236 **Plasma Dynamics** (3)

Study of the interaction of fluids with electromagnetic fields. Generalized Navier-Stokes and energy equations, magnetogasdynamic and magneto-hydrodynamic approximations, boundary-layer theory, statistical theory of turbulence, generalized Von Karman-Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 207. (Spring, 1980 and every third year thereafter—evening) (Braun)

237 Waves in Random Media (3)

Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and randomly distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communication channel modeling. Computer simulation by Monte Carlo techniques. Prerequisite: EE 204, 207. (Fall, 1980 and every third year thereafter—evening) (Lang)

238 Remote Sensing (3)

Description and analysis of active and passive remote sensing systems including scattermeters, real aperture imaging and synthetic aperture radars. Sensing of surface, subsurface and atmospheric parameters at microwave, infrared and optical frequencies. Analysis of radiometric techniques using radiative transport theory; inverse scattering methods; profile inversion. Prerequisite: EE 207. (Spring, odd years—evening) (Lang)

239 Numerical Laboratory in Electromagnetics (3)

Numerical methods for the solution of electromagnetic problems dealing with scattering by complex shapes, antenna design, transmission through anisotropic and dispersive media, electrodynamic interactions with charged particles. Convergence experiments dealing with moment methods, hybrid GTD, variational computations. Prerequisite: EE 207 and CSci 100. (Fall, even years—evening) (Kahn)

241 Information Theory (3)

Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communication system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204. (Fall—evening) (Chang)

242 Coding Theory (3)

The PCM Communication System, mathematics of coding; groups, rings, and fields; linear codes: parity and generator matrices, syndromes error correction and deletion capability, minimum distance; performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation; cyclic codes: implementation and performance; BCH codes: encoding, decoding, minimum distance, the BCH decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes. Prerequisite: EE 204. (Spring—evening) (Chang)

243 Communication Theory I (3)

Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall—day and evening; spring—evening) (Pickholtz)

244 Communication Theory II (3)

Schemes for efficient signaling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov-Jelinek, Fano) and MAP (Viterbi)

algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243. (Spring—day and evening) (Pickholtz)

245 Signal Detection and Estimation Theory (3)

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244; or equivalent. (Fall—evening) (Pickholtz)

246 Digital Communications (3)

Digital transmission for data, voice, and video. Modern practice in data communication; voice digitization, PCM, delta modulation, linear predictive coding. Bounds for digital signaling, pulse dispersion and intersymbol interference. Nyquist criteria, eye openings; adaptive equalizers, decision feedback, partial response techniques. Regenerative repeaters; timing extraction, synchronization and jitter. Transmission codes. Multiplexing and framing. Error control for data. Digital switching and integrated digital networks. Prerequisite: EE 241, 244 or equivalent. (Spring—evening) (Pickholtz)

247 Communication Systems (3)

Analysis and design of coherent communication systems. Phase-locked loop dynamics noise behavior and optimization. Parameter estimation theory and Wiener filters with application to optimum demodulation of analog waveforms (DSB-AM, SSB-AM, FM). Partially coherent digital demodulation. Comparative analysis of modulation systems. Frequency acquisition and synchronization. Selected topics in channel impairments and multiple access. Prerequisite: EE 241, 244. (Fall—evening) (Pickholtz)

248 Data Communication Systems (3)

Introduction to data networks. Common carriers, specialized carriers, value added networks. Operations, facilities, services, tariffs. Data transmission over the telephone network. Channels, carriers systems, hierarchies. Terminals, modems, multiplexors, concentrators, communication processors. Standards and protocols. Coding for error control, data encryption. Data transmission via satellite. Communication software. Survey of domestic and foreign data networks. Regulatory and economic issues. (Fall—evening) (Helgert) (Should be taken in sequence with EE 249.)

249 Theory of Data- and Computer-Communication Networks (3)

Design and analysis of computer-communication and terminal oriented networks. Line, message and packet switching. Traffic theory for data. Queuing models. Delay and cost minimization, topological design algorithms. Network routing, polling, and flow control. Analysis and design of protocols for packet switched structures. Prerequisite: EE 204 or 205. (Spring—evening) (Pickholtz) (Should be taken in sequence with EE 248)

***250 Telecommunication Systems Concepts** (3)

Essential elements of an electrical communication system, speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency, and pulse code modulation and comparative performance. Multiplexing schemes, communication quality standards, and objectives. Signal power,

* 250 cannot be applied toward a graduate degree in the School of Engineering and Applied

noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunication, microwave radio, cable, and satellite communications systems. (As arranged) (Pickholtz)

***251 Survey of Telecommunication Systems** (3)

Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design consideration and values of significant parameters for a typical satellite communications link. Overall design of a cable communication system. Digital transmission and terminals. Wideband data transmission. Frequency allocation. (As arranged) (Pickholtz)

252 Digital Signal Processing Techniques (3)

Signal representations, sampling and quantization, transform techniques. Recursive estimation, linear predictive filtering, recursive and nonrecursive digital filter design. Computer-aided design. Prerequisite: EE 51 or equivalent. (Fall, even years) (Kyriakopoulos)

253 Sonar Systems (3)

Underwater sound propagation; transducer and transducer arrays; detection, localization, and tracking techniques; array processing; time compression correlation and digital processing of signals; effects of nonhomogeneous noise fields; applications to navigation and communications in the ocean environment. Prerequisite: EE 204. (Fall—evening) (Helgert)

254 Radar Systems (3)

The radar equation, range and resolution limits; MTI radars; detection and estimation techniques; clutter characteristics and detection in clutter; signal design; ambiguity functions; Doppler radar; phased arrays; synthetic aperture techniques; digital and optical processing and computer control. Applications. Prerequisite: EE 206, 244. (Spring—evening) (Helgert)

255 Optical Processing (3)

Fourier transforms by diffraction of light, optical spectrum analysis, optical memories and systems, holography and holographic techniques, properties and techniques for photographic reproduction. Prerequisite: EE 201. (Fall, even years—evening) (Kahn)

257 Secure Communications (3)

Spread-spectrum techniques, time and frequency hopping, direct sequence encoding. Link jamming models and jamming effectiveness. Adaptive null steering arrays, nulling algorithms, effects of intelligent jammers. Data link encryption, data encryption standards and public key cryptosystems. Prerequisite: EE 242, 244. (Fall—evening) (Pickholtz)

258 Radio Communication Systems I (3)

Analysis and design of microwave communication systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of earth curvature and characteristics

* **EE 251** cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

of over-land and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244. (Fall—evening) (Lang)

259 Radio Communication Systems II (3)

Morphology of the ionosphere, propagation of ionspherically reflected radiowaves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, non-Gaussian channel performance, diversity, fading channel error control, typical VLF, LF, and HF system design. Prerequisite: EE 258 or permission of instructor. (Spring—evening) (Lang)

261 Electromechanical Energy Conversion (3)

Characteristics of synchronous machines, synchronous reactance, reactance theories, synchronizing generators and parallel operation of machines, characteristics of asynchronous machines, machines as circuit elements. Steady-state and dynamic performance of alternating current machines. Prerequisite: EE 201, 206, or permission of course director. (Fall—evening) (Harrington)

262 Control of Rotating Machinery (3)

Dynamic requirements of industrial drives. Detailed analysis of inverter circuits. Frequency control of inverter drives and cycloconverters. Computer modeling of rectifier and inverter circuits. Feedback control loops and their effect on stability. Prerequisite: EE 177, 201, 202, 206, 261, or permission of course director. (Fall—evening) (Harrington)

264 Direct Electrical Energy Conversion (3)

Theory and practice for direct production of electricity using solar cells, thermionic converters, fuel cells, and batteries. Concepts of solid state energy bands, work function and conversion efficiency, and limitations. Prerequisite: EE 201, 206, or permission of course director. (Spring—evening) (Harrington)

265 Electrical Power Production (3)

Production of electrical power from primary energy sources. Use of hydrocarbon fuels in the production of steam. Hydroelectric generation and tidal variations as primary energy. Geothermal energy, nuclear fission, magnetohydrodynamics, fusion, and solar concentrators as primary energy sources. Prerequisite: EE 201, 206, or permission of course director. (Fall, odd years—evening) (Harrington)

266 Electrical Power Transmission (3)

(Formerly Electrical Power Transmission and Distribution)

EHV AC and DC power transmission. Overhead and underground cable transmission systems. Computer simulation and analysis of transmission line transients, insulation coordination, optimum loading of transmission facilities. Prerequisite: EE 201, 206, or permission of course director. (Spring, even years—evening) (Harrington)

267 Power Networks (3)

Symmetrical components, short- and open-circuit analysis of power networks. Stability of electrical grids, fault analysis, and load flow analysis. Prerequisite: EE 177, 201, 206, 266, or permission of course director. (Fall, even years—evening) (Harrington)

268 Electrical Power Distribution (3)

Transformer and insulation design at distribution voltage levels. Medium and low voltage switchgear requirements. Protective relaying, harmonic filtering, power factor correction, grounding systems. Prerequisite: EE 201 or permission of course director. (Spring, odd years—evening) (Harrington)

269 Overall Electrical Power Generation Plant Design (3)
(Formerly Issues in Electrical Power Systems)

Energy source design, boiler and turbine design and construction, synchronous generator and transformer requirements. Power station auxiliary plant. Exciter and governor design. Prerequisite: EE 177, 178, 201, 206, or permission of course director. (Fall, odd years—evening) (Harrington)

271 Linear Multivariable Control Theory (3)

Control of systems having multiple inputs or outputs. Topics useful in the control of multivariable systems include the algebraic theory of multivariable feedback; static and dynamic decoupling; invertibility; modal control; integrity; computer-aided frequency domain techniques such as feedback design, using inverse Nyquist arrays and characteristic loci design. Prerequisite: EE 172, 202, or equivalent. (Spring, even years) (Carroll)

272 Computer Control Systems (3)
(Formerly Discrete Systems)

An analysis of automatic control systems in which the control procedure uses on-line digital computation. Topics include single and multirate sampling, *Z*-transforms, responses of discrete systems, stability criteria, discrete control design. Prerequisite or concurrent registration: EE 202 (Spring or fall) (Carroll)

273 System Optimization (3)

Parameter optimization problems; theory of minima and maxima. Optimization problems for dynamic systems; calculus of variations; the maximum principle and the Hamilton-Jacobi equation. Optimization problems with constraints; optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 203 or equivalent. (Spring—evening) (Carroll)

274 Nonlinear Systems (3)

Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov's asymptotical method and Tsypkin's locus. Forced oscillations—jump resonance. Stability analysis—Liapunov's criterion, Luré's problem, and Popov's method. Prerequisite: EE 203. (Spring, odd years—evening) (Carroll)

275 System Identification and Adaptive Control Systems (3)
(Formerly System Identification and Adaptive Systems)

Identification is the process of mathematically modeling a system based on measurement data that may be limited or uncertain. Adaptive control is the means whereby a system that is poorly modeled is controlled adequately. Various approaches to each of these problems are discussed, including the least-squares approach of identification and the stability approach to adaptive control. Prerequisite: EE 202, 204. (Spring—even years) (Carroll)

276 Cybernetics (3)

Principles of machines or mechanisms made by men or nature with regard to their ways and forms of possible behaviors: regular, determinate, or reproducible; fundamental concepts of finite differences; changes and transformations as sets of transitions, leading to stability and feedback; statistical concepts of complex systems and blackbox theory; Shannon's information theory; regulation and control of mechanisms. Prerequisite: EE 204 or equivalent. (Fall, odd years—evening) (Helgert)

277 Satellite Communication Systems (3)

Theoretical and applications aspects of satellite communications. Modulation and multiple access techniques. Link design. Satellite transponders and antenna systems. Ground stations. Random access techniques and satellite packet communications. Prerequisite: EE 244. (Fall—evening) (Pickholtz)

278 Spacecraft Systems Design (3)

Space environment; structure, propulsion, control, and instrumentation of spacecraft—launch, orbit, transit, and re-entry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years—evening) (Heller)

279 Stochastic Control Systems (3)

Introduction to random process in control; properties of Markov process, systems of covariance equivalence, of deterministic and stochastic control equivalence; dynamic programming for Markov process—principle of optimality; linear systems with quadratic cost, Kalman filtering, smoothing and predicting. The separation theorem and applications concepts of adaptive estimations. Prerequisite: EE 204, 273. (Fall, odd years) (Lee)

280 Introduction to Medicine for Engineers I: Physiology and Anatomy (3)

Designed to acquaint the engineering student with the physiology of the human body; material based on the curriculum of the School of Medicine and taught from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs, which are then related to the various systems of the body; interrelationships of the body systems, i.e., the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall—evening) (Eisenberg)

281 Introduction to Medicine for Engineers II: Physiology and Anatomy (3)

Further elaboration of physiological systems, such as the endocine system, renal physiology, gastrointestinal physiology, and others; the separate systems of the body are integrated to present the functioning of the body as an overall system; considerable interaction with physicians and other medical personnel. Prerequisite: EE 280. (Spring—evening) (Eisenberg)

282 Medical Instrumentation I (3)

Theory of measurements in biological areas, techniques for electronic measurements on biological specimens, current problems in medical metrology stressing electronic systems. Prerequisite: EE 280 or permission of instructor. (Fall—evening) (Eisenberg)

283 Medical Instrumentation II (3)

Medical telemetry systems, medical use of the computer, engineering techniques in patient treatment, principles of good medical instrumentation. Prerequisite: EE 280 or permission of instructor. (Spring—evening) (Eisenberg)

285 Sensory-evoked Potentials I (3)

Physiological significance of the sensory-evoked potential, stimulation variables, subject variables, data acquisition procedures and instrumentation, signal-averaging computers, analysis techniques for the VEP, applications of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 280, 281, 282, 283, or permission of instructor. (Fall—evening) (Eisenberg)

287 Rehabilitation Engineering (3)

Application of engineering theory and techniques to the rehabilitation of handicapped persons; major problem areas and general approaches, as well as specific solutions. Prerequisite: EE 281. (Spring, odd years—day) (Eisenberg)

289 Clinical Engineering (3)

A cross-sectional view of clinical engineering applications, functions, variations, and patterns in the medical and allied health care area. Use of instrumentation, computers, and systems by clinical engineers in hospitals and clinics. The clinical engineer in cardiovascular measurement systems and intensive care units; other areas where functional usage of clinical engineering is applicable. Prerequisite: EE 280, 282, 283. (Fall, even years—evening) (Eisenberg)

298 Research (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

319 Systems Science, Networks, and Controls Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

321 Approximate Mathematical Techniques for Electromagnetics (3)

Asymptotic methods for Maxwell's equations, geometric optics, WKB approximation for stratified media, uniform expansion near a caustic and shadow boundary; perturbation techniques for tenuous medium—Rayleigh Gans approximation, smoothing and multivariable methods for stochastic problems. Prerequisite: EE 204, 207. (Spring, 1982 and every third year thereafter) (Lang)

322 Advanced Waveguide Diffraction and Design (3)

Selections from the following: Analytical treatment of waveguide bifurcations and discontinuities by Wiener-Hopf, mode matching, static approximation, and other techniques. Small apertures (obstacles) in waveguides. Variational methods for evaluation of equivalent circuit parameters. Group theoretic methods for symmetrical junctions. Prerequisite: EE 233. (Fall, 1982 and every third year thereafter) (Kahn)

323 Principles of Microelectronics (3)

Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years—evening) (Helgert)

329 Electrophysics Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

345 Advanced Detection Theory (3)

Review of general estimation equations. Linear estimation; Weiner and Kalman-Bucy filters; nonlinear modulation theory; angle-modulation systems, analysis and design of phase-lock loops, optimum angle-modulation, rate distortion theory; Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring—evening) (Pickholtz)

346 Communications Switching and Traffic Theory (3)

Switching network technology, step-by-step common control, stored program electronic switching systems. Traffic models. Engineering of multiple server systems, analysis of graded multiples and multistage connecting networks. Software issues, digital time division and store and forward switches. Analytical bounds on the complexity of switch networks, combined circuit and message switching. Current practice and practical issues. Prerequisite: EE 243 or permission of instructor. (Spring, even years—evening) (Pickholtz)

347 Data Communications (3) (Same as CSci 244)

Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexors, concentrators. Line control procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing; terminal-oriented systems, data collection loops, multi-drop lines. Switched data systems; circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisite: EE 243 and CSci 201, 202, or permission of instructor. (Spring—evening) (Pickholtz)

349 Communications Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

369 Issues in Electrical Power Systems (3)

Electrical effects of overhead transmission lines, corona effects, radio and television interference, audible noise, and ozone emissions. Prerequisite: EE 178, 201, 206, or permission of course director. (Spring, odd years—evening) (Harrington)

371 Simulation Methods for System Analysis (3)

Survey of simulation languages. Techniques of model building for material- and machine-based systems. Treatment of these systems with notion of transactions and states. Modeling the dynamic processes of growth

problems. Analog, hybrid, and digital methods for simulation treated by means of case studies; speed and cost of alternate computing procedures. Project-type problems used to illustrate simulation methods. Prerequisite: CSci 278 or permission of instructor. (Fall, odd years—evening) (Bock)

372 Analysis and Control of Large Systems (3)

Systems as multistage decision processes. Analytical concepts of model-making and matrix representations of large systems. Approximation by models of lower dimension—reduction to simplified models; decentralized systems. Differential games; computation of saddle points; construction of an equilibrium point. Prerequisite: EE 273. (Fall, even years—evening) (Lee)

380 Bioelectric Phenomena (3)

Mathematical treatment of selected bioelectric phenomena. Membrane thermodynamics; membrane electrical potentials and subthreshold membrane effects; membrane dynamics. Solid-state phenomena in biology and medicine. Photoconduction. Mechanism of nerve propagation. Electrical models of the heart. Cell physiology. Quantum effects in biological systems. Prerequisite: EE 206, 280, 282, 283. (Fall, odd years—evening) (Eisenberg)

381 Computer-aided Analysis of Physiological Signals (3)

Computer analysis of physiological data obtained from the cardiovascular, pulmonary, and nervous systems. Sources and detection of various signals obtained from these systems; preprocessing of real signals; algorithmic techniques applicable to the analysis of these signals. Students are provided with real data and develop computer software for determining pertinent medical parameters as established by physicians. Prerequisite: EE 280, 281, 282, 283, and a working knowledge of FORTRAN. (Spring, odd years—evening) (Loew)

382 Physiological Controls and Systems (3)

Some applications of control and systems theory in the medical and biological fields. Application of general control and systems theory as applied to physiological systems. Specific applications of control and systems theory to the visual system, respiratory system, cardiovascular system, and musculoskeletal system. Prerequisites: EE 172 or equivalent; EE 280, 281, 282, 283. (Spring, even years—evening) (Loew)

385 Sensory-evoked Potentials II (3)

A continuation of EE 285. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research; emphasis on clinical applications. Planning and conducting an advanced (clinical or research) project chosen to take maximum advantage of the student's technical background from an instrumentation, computer, and data analysis viewpoint. Prerequisite: EE 285 and permission of instructor. (Fall, odd years—evening) (Eisenberg)

389 Medical Engineering Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Computer Science Graduate Courses

201 Introduction to Computer Systems (3)

Introduction to programming digital computers in assembly languages. Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Techniques of structured programming. Use of a higher-level procedural language. Stacks and recursion. Prerequisite: CSci/EE 51 or CSci 100 or equivalent (FORTRAN), and programming experience using assembly language. (Fall and spring—evening) (Bock)

203 Microprocessors and Microcomputers (3)

Microcomputer structure and components. Microprocessor architecture, registers, ALU, stacks, information flow, and control. Microprocessor support hardware, RAMS, ROMS, PLA's, counter timers. Hardware and software of typical 8-bit microcomputers. I/O structure in microcomputers; interrupts and DMA operations. 16-bit microprocessors, hardware structure and software capabilities. Bit-slice microprocessors. Prerequisite: CSci 154 or permission of instructor. (Fall—evening) (Abdalla)

208 Computer Programming (3)

Use of a macroassembler in structured programming. Input/output programming at the assembly level. I/O buffer pools and their management. Program status and control, interrupt handling, reentrant subroutines. Linkers and loaders. Utilities. Introduction to operating systems and job control languages. Prerequisite: CSci/EE 158 and CSci/EE 157; or CSci 201 or permission of instructor. (Spring—evening) (Maurer)

213 Discrete Structures in Computing (3)

Introduction to discrete mathematical structures used in computing. Sets, graphs, functions, mappings, lattices, groups, and semigroups. Combinatorial problems and enumerations. Finite-state machines, representations, identification, transitions, and reductions. Directed graphs, trees, and paths through a program. Regular expressions and relations between programs and computing machines. Prerequisite or concurrent registration: CSci 51 or CSci 100 and permission of instructor. (Fall and spring—evening) (Pickholtz)

215 Advanced Data Structures and High-Level Algorithms (3)

Exchange sorting, binary search, sparse matrix transpose and multiplication. Stack and queue insertion and deletion. List insertion and deletion, lists of available space. The boundary tag method, the Deutsch-Schorr-Waite algorithm, the Knuth-Morris-Pratt algorithm. Inorder, preorder, and postorder traversal of trees, alpha-beta pruning, Tarjan's UNION and FIND. Depth-first and breadth-first search, Kruskal's algorithm, topological sorting, shortest paths in a graph. Quicksort, heap sort, radix sorting, merge sorting, sorting of files. Binary search trees, including AVL trees. B-trees and tries. Hashing and collision handling. Critical paths and PERT. Prerequisite: CSci 159. (Spring—evening) (Berkovich)

216 Information Retrieval Systems (3)

Information organization and retrieval of natural language data by digital computer systems; statistical, syntactic, and logical analysis of natural language used for retrieval systems; dictionary systems including thesaurus look-up and phrase structures; searching strategies and cataloguing. Input

preparation and output structures; large-scale file structures and operating systems required for their use. Prerequisite: CSci 159; or permission of instructor. (Spring—evening) (Foley)

219 Interactive Computer Graphics I (3)

Architecture and implementation of display and interaction devices. Interactive graphics programming. Functional capabilities of graphics packages. Implementing a graphics package. 2D and 3D viewing, clipping, and transformations. Interaction techniques and human factors. Raster graphics scan-conversion algorithms. Hidden surface and hidden edge removal algorithms. Shading and texturing techniques. Prerequisite or concurrent registration: CSci 159 or permission of instructor. (Fall—evening) (Foley)

220 Pattern Recognition (3)

Applications of pattern recognition, vector spaces, estimation and samples; Bayes estimation; density functions; stochastic approximation; decision rules in pattern recognition, minimal risk, Gaussian filters; bounds of risk, nearest-neighbor decision rules; clustering techniques, feature extraction. Sequential and nonparametric methods. Pattern recognition with *a priori* knowledge. Introduction to syntactic methods. Prerequisite: EE 204. (Fall—evening) (Loew)

222 Design of User-Computer Dialogues (3)

Design of dialogues for interactive terminal systems, including graphics systems. Psychological, physiological, linguistic, and perceptual factors. Advantages and disadvantages of various interaction techniques, command language syntaxes, and data presentations. Design methodology and guidelines. Case studies, research readings, and projects. Prerequisite: CSci 159 or permission of instructor. (Spring—evening) (Foley)

223 Simulation and Heuristics (3)

Techniques of deterministic and probabilistic simulation on the digital computer. Mathematics for simulation; design of systems modules; random number generation and testing. Markovian and bounded context systems; generation of stochastic variates; Monte Carlo techniques; heuristics; verification techniques; simulation languages. Prerequisite: ApSc 115, CSci/EE 157, 158, or CSci 159 (or former CSci 214), 201, and permission of instructor. (Fall—evening) (Bock)

224 Artificial Intelligence (3)

Survey of topics. Analogies and simple concepts. Symbol manipulation and programming in LISP. Networks and simple learning. Scene analysis and sentence analysis. Programming the BLOCKS world. Depth-first and breadth-first searching, hill-climbing, network searching, min-max and alpha-beta pruning. Problem-solving systems. Prerequisite: CSci 159. (Spring—evening) (Bock)

227 Management Information Systems and Data Base Management (3)

Concepts in management information systems. Commercial programming features of COBOL and PL/I. Inverted files and query systems. Editing, report generation, updating, and updating load. Tradeoff between direct access and indexed-sequential access. Maintaining large programming systems which lead to the need for data base management systems; construction of data base management systems. Survey of some existing data base systems. Relational data base concepts and future develop-

ments. Students will do conceptual and logical design of a database. Prerequisite: CSci 159 and 208. (Fall—evening) (Berkovich)

229 Security and Privacy in Computer Systems (3)

Techniques for security of data and programs in computer systems. Authentication methods, logging, authorization, encryption, problems of statistical inference. Effects of operating systems and machine architecture on security. Cost trade-offs and risk analysis among various countermeasures. Theoretical models. Related nontechnical measures. Effect on system design of legal constraints on data banks. Current and potential legal constraints. Prerequisite: CSci 159 or equivalent. (Fall—evening) (Hoffman)

231 Sequential Machines (3)

Finite state sequential machine theory and design, state identification, information losslessness, state minimization in incompletely specified tables partition theory, decomposition of machines, asynchronous machine design, structural simplicity and design with ROM's and PLA's (Planar Logic Arrays). Prerequisite: EE/CSci 153. (Fall—evening) (Friedman)

232 Automata and Formal Languages (3)

Regular expressions including equality and transformations between sequential machines and regular expressions. Turing machines, recursive functions, predicate calculus, and computability. Complexity of algorithms. Formal language theory including grammatical construction, recognizers, relationships between machines and grammers. Nondeterministic automata. Prerequisite: CSci 213. (Spring—evening) (Feldman)

237 Computing Systems (3)

Organization of large digital computer systems. Design of high-speed arithmetic units. Random access and associative memories; rotational storage devices; computer control and interrupt structures. Input-output channels and interfacing problems. Communications in digital computers. Introduction to multiple-access and time-sharing systems. Prerequisite: CSci/EE 154. (Fall—evening) (Abdalla)

239 Comparative Computer Systems (3)

Structures of computers and a general language for system description. History of different computer structures. Development of the operating system. Special purpose processors. Multiprocessors and large computing systems. Computer networks and time-shared systems. Comparison of computer families. Characteristics and philosophies of computer design of the major manufacturers. Introduction to performance evaluation and measurement. Effects of software and technology on computer structures. Prerequisite: CSci 237, 263. (Spring—evening) (Meltzer)

240 Theory and Practice of Microprogramming (3)

Basic concepts, techniques, and theory of microprogramming as applied to the implementation of control systems for sequential machines. Microprogramming languages, assemblers, and hardware simulators, including specific applications of these to the design of current computer systems and their interfaces with real-time systems. Prerequisite: CSci 157, 237. (Spring—evening) (Merwin)

243 Fault Tolerant Systems and Design Automation (3)

Fault test generation for combination and sequential circuits, digital simulation as a diagnostic tool, design of easily tested and fault tolerant systems. Physical packaging of digital circuits; design of circuit boards

including partitioning, placement, and interconnection of elements. Prerequisite: CSci/EE 153. (Fall—evening) (Friedman)

244 Data Communications (3) (Same as EE 347)

Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexors, concentrators. Line control procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing; terminal-oriented systems, data collection loops, multi-drop lines. Switched data systems; circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisite: EE 243; CSci 201 or permission of instructor. (Spring—evening) (Meltzer)

245 Advanced Computer Systems Theory I (3)

Analytical models applied to computing systems. Determinance, deadlocks, concurrency, and synchronization of computer processes. Optimal task scheduling using linear graph theory. Concurrent processes in multiprocessors. Analysis of the overlap of I/O and CPU processing. Queuing theory applied to time-shared computer models. Analysis of secondary storage devices and effective data rate. Analysis of memory buffer pools and multiprogrammed memory allocation. Memory allocation and storage heirarchy operation and their effect on throughput and response time. Prerequisite: EE 204; CSci 237, 263. (Fall—evening) (Abdalla)

246 Advanced Computer Systems Theory II (3)

Optimum secondary storage placement algorithms to improve throughput. Modeling of secondary storage operation and data staging. Analysis of memory allocation algorithms to improve system performance. Characteristics of computer system hardware and software to provide for multiprocessing, multiprogramming, and time-shared operation. Loosely and tightly-coupled multiprocessors. Analysis of front-end processors in data base operation and computer networks. System analysis of a large, time-shared, terminal-oriented transaction processing system. Prerequisite: CSci 245. (Spring—evening) (Abdalla)

255 Analysis and Correctness of Algorithms (3)

Basic tools of analysis of algorithms. Space and time measures, O(n) and O(f(n)), computer time versus programmer time. Divide-and-conquer, backtracking, branch-and-bound. Lower bounds on computations. NP-hard and NP-complete problems. Correctness, partial correctness, termination, run-time errors. The inductive assertion method, verification conditions and their generation and proof. Applications to algebraic and assembly languages. Prerequisite: CSci 159. (Fall—evening) (Maurer)

256 Design of Translators (3)

Design of procedure-oriented computer languages. Semantics and pragmatics as they affect the design of translators, interpreters, and compilers. Top-down and bottom-up recognizers. Production of machine code. Syntax-directed compiling. Tables and their organizations in translators. Optimizing compilers; compiler-compilers. Prerequisite: CSci 159. (Spring—evening) (Maurer)

258 Advanced Programming Languages (3)

Recent developments in programming language research. Modern data structuring concepts such as abstract data structures, access control for reliability, and structuring of data in special-purpose languages. Language extensibility. Machine-independent design of language processors. Case

studies will include Snobol 4, Pascal, and advanced concepts in PL/I. Students' projects will emphasize applications of these languages and concepts. Prerequisite: CSci 159 and permission of instructor. (Spring—evening) (Feldman)

263 Digital Computer Programming Systems (3)

Design of computer systems software. Design and programming of an assembler and loader. Multiprogrammed job control including linking, loading, linkage-edit, relocatability, region size, and status switching. Design of dispatchers and monitors. Design of utility programs. Input-output programming and control. Communications among components of the operating system. Prerequisite: CSci 159 and 208. (Fall—evening) (Maurer)

267 Operating Systems I (3)

Introduction to the operating system for batch-oriented multiprogrammed computer systems. Software components which constitute the operating system. Facilities of the macro-assembler which utilize the operating system; loading and linking routines; initializing programs and tasks; dispatching and the interrupt mechanisms. Memory management in fixed and variable partitions; device and storage management. Input-output control and use of access methods. Performance evaluation. Prerequisite: CSci 263. (Fall—evening) (Hoffman)

268 Operating Systems II (3)

Introduction to operating systems for time-shared and multiprocessor computer systems. Processor management in a multiprocessor system; deadlocks, processor utilization, and I/O management. System availability and fail-soft mechanisms. Time-slicing and time-sharing operating systems and subsystems; transaction processing subsystems; memory management in a paged and segmented virtual memory system. Performance of the operating system. Computer network software and an introduction to the computer as a utility. Introduction to security and large data base management. Prerequisite: CSci 267. (Spring—evening) (Hoffman)

278 Analog and Hybrid Computers (3)

Analog computer components and electronics. Slow analog computer solutions of linear and nonlinear differential equations. System simulation and modeling on the analog computer. Introduction to the iterative analog computer. Transfer function simulation and use in control theory. The hybrid computer, digital logic, and digital computer control. Digital-to-analog and analog-to-digital converters and interfaces. Optimization methods on a hybrid computer. Parameter variations and searching methods. Prerequisite or concurrent registration: CSci/EE 154; or permission of instructor. (Fall—evening) (Bock)

281 Applications of Numerical Methods I (3)

Basic numerical methods with emphasis on their application to engineering problems. Error sources and error control; numerical representation of functions; over-determined systems; eigenvalues and eigenvectors; introduction to nonlinear equations; initial value and boundary value problems for ordinary differential equations. Theoretical concepts such as order of accuracy, Richardson's extrapolation, norm, stability, and convergence. Some modern methods such as spline approximation and the QR algorithm for eigenvalues. Prerequisite: CSci 201 or equivalent. (Fall—evening) (Meltzer)

282 Applications of Numerical Methods II (3)

A continuation of CSci 281. Systems of nonlinear equations; numerica optimization; numerical solution of common partial differential equation of engineering; methods for hyperbolic, parabolic, and elliptic problems introduction to finite element methods. Prerequisite: CSci 281. (Spring, even years—evening) (Meltzer)

285 Approximation of Functions and Data Representations (3)

Review of linear spaces; least squares, orthogonal functions; nonlinear techniques, gradient search methods; parameter estimation with discrete data; Tchebysheff approximation; approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 281. (Fall—evening at NASA-Langley Research Center; fall, odd years—evening on campus) (Meltzer)

286 Numerical Methods in Engineering I (3)

Computational methods for solution of systems of linear algebraic equations and for the solution of the algebraic eigenvalue problem. Emphasis on accuracy and efficiency. Methods for banded and other sparse systems. Methods for parallel and pipeline processer computers. Prerequisite: CSci 281 and knowledge of linear algebra. (Spring, even years—evening) (Meltzer)

287 Numerical Methods in Engineering II (3)

Computational methods for solution of systems of ordinary differential equations: single-step methods, general multistep methods; convergence and stability analysis, methods for stiff equations, step size control and control of order. Prerequisite: CSci 281 and knowledge of differential equations. (Spring, odd years—evening) (Meltzer)

288 Numerical Methods in Engineering III (3)

Computational methods for solution of boundary value problems in both ordinary and partial differential equations: shooting methods, finite difference methods, functional approximation methods, invariant imbedding, method of lines, treatment of boundaries in multidimensional problems. Prerequisite: CSci 282 and knowledge of differential equations. (Fall, even years—evening) (Meltzer)

289 Numerical Methods in Engineering IV (3)

Computational methods for solution of initial value problems for partial differential equations: method of lines, consistency, stability, convergence; explicit and implicit finite difference methods, alternating direction methods, high-order methods. Prerequisite: CSci 282 and knowledge of partial differential equations. (Spring, odd years—evening) (Meltzer)

298 Research (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

319 Interactive Computer Graphics II (3)

Hidden surface algorithms, mathematics and data structures for surface representation, surface texture models, color models, animation, simula-

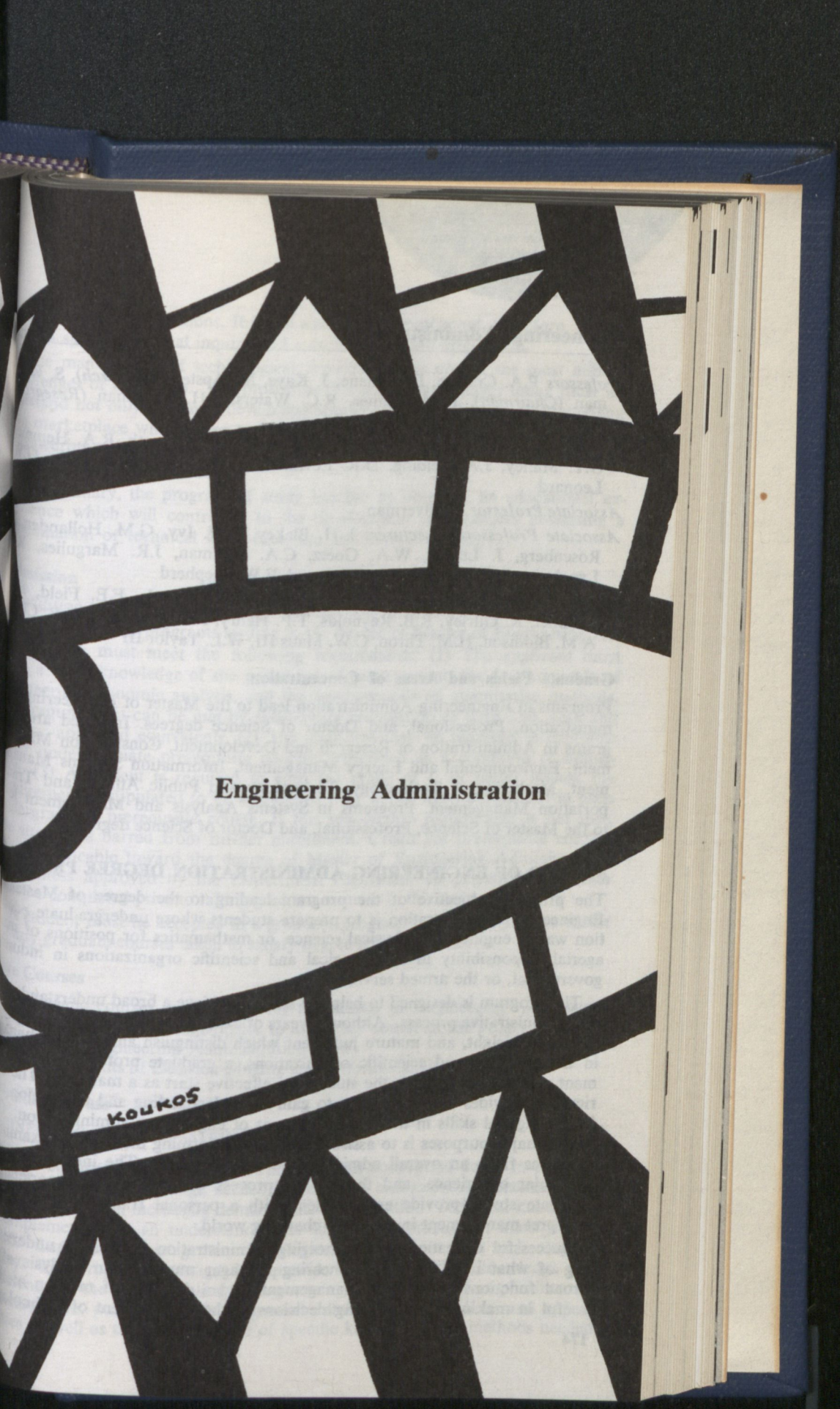
tion, graphics programming languages, architecture of high-performance hardware, homogeneous coordinates. Prerequisite: CSci 219. (Spring, even years—evening) (Foley)

391 **Computer Science Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)



Engineering Administration

Engineering Administration

Professors P.A. Crafton, P.S. Shane, J. Kaye, M. Apstein *(Research)*, S. Roth man *(Chairman)*, H.M. Steiner, R.C. Waters, J.H. Schulman *(Research)* H.B. Sewell, J.E. Duberg *(Research)*

Professorial Lecturers J.B. Du Peza, C.W. Fotis, D.P. Hearth, R.A. Hemmes G.T. Malley, J.A. Belding, D.R. Levin, E.S. Hoe, A.G. Hoshovsky, G.W Leonard

Associate Professor B. Silverman

Associate Professorial Lecturers L.H. Blakey, E.W. Ivy, G.M. Hollander, P Rosenberg, J. Lisnyk, W.A. Goetz, C.A. Kottman, J.R. Margulies, R.J. Lynch, Jr., R. Blanchard, J.T. Solomond, F.W. Shepherd

Assistant Professorial Lecturers T.L. Griswold, S.F. Pauls, F.E. Field, H.S. Kimmel, R. Gurley, R.B. Reynolds, T.P. Henry, J.L. Pokorney, M.P. Clark, A.M. Biddison, H.M. Thron, C.W. Maus III, W.L. Taylor III

Graduate Fields and Areas of Concentration

Programs in Engineering Administration lead to the Master of Engineering Administration, Professional, and Doctor of Science degrees. Included are programs in Administration of Research and Development, Construction Management, Environmental and Energy Management, Information Systems Management, Marketing of Technology, Technology and Public Affairs, and Transportation Management. Programs in Systems Analysis and Management lead to the Master of Science, Professional, and Doctor of Science degrees.

MASTER OF ENGINEERING ADMINISTRATION DEGREE PROGRAM

The principal objective of the program leading to the degree of Master of Engineering Administration is to prepare students whose undergraduate education was in engineering, physical science, or mathematics for positions of managerial responsibility in technological and scientific organizations in industry, government, or the armed services.

The program is designed to help the student achieve a broad understanding of the administrative process. Although years of experience are required to develop the skills, insight, and mature judgment which distinguish an effective manager in technological and scientific organizations, a graduate professional management curriculum can give the student an effective start as a manager. The curriculum provides an opportunity to gain an understanding and to develop useful managerial skills in the functional areas of engineering administration. One of the major purposes is to assist the student in forming the habit of examining problems from an overall administrative point of view. The individual's own particular experience, and the explicit process of relating this experience to graduate study, provide each student with a personal frame of reference to interpret management in a rapidly changing world.

Successful education for engineering administration implies an understanding of what it is that an engineering manager must do, an analysis of the broad functions involved in management, and a detailing of modern methods useful in making and executing decisions in the management of technological

and scientific organizations. It is the aim of the Department, therefore, to keep alive a spirit of general inquiry and a decision-making orientation.

The management of technological organizations is one of the most difficult challenges of our times. The professional engineering manager today must understand not only currently developing technologies but also the rapidly changing marketplace where these technologies are applied for society's benefit. The engineering administrator is the link between these dynamic technologies and the needs of society in general.

In summary, the program of study has for its objective an educational experience which will contribute to the development of managers possessing a combination of technical know-how and administrative skill.

Admission

In addition to the requirements for admission to graduate study (see pages 27–28), applicants for programs leading to the degree of Master of Engineering Administration must meet the following requirements: (1) The applicant must have a basic knowledge of the principles of management, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of EAd 150, 160, and 170, or approved equivalents. (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration and, unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

A student must be accepted in a graduate program in order to receive credit for any graduate courses taken to satisfy degree requirements.

Core Courses

The following courses are required for the Master of Engineering Administration degree and must be taken prior to any other course in the program:
EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision-Making and Problem-Solving (3)

General Program

ENGINEERING ADMINISTRATION

Study in engineering administration provides the conceptual depth in management practice and knowledge needed by technical and scientific personnel who are confronted with increasing demands and complexities. Technical knowledge is complemented by an understanding of theory and practice in management action. Engineering management is a logical development of a technological society. The program is designed to provide engineers with a knowledge and proficiency in the administration of engineering and science. It emphasizes use of deliberative, purposive study of general administrative problems and opportunities as well as the study and use of specific knowledge and methods needed

to solve administrative problems and to explore opportunities. A program i prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Ad ministration (3) (non-thesis)
Electives (15–21). Electives are chosen from the Department of Engineering Administration and other departments of the University, but no more than two courses may be chosen from other departments.

Areas of Concentration

Students wishing to pursue a specific area of concentration, as opposed to following the general program in EAd, may select one of the following programs:

ADMINISTRATION OF RESEARCH AND DEVELOPMENT

The program is designed to prepare students for responsible managerial positions in organizations conducting technological or scientific research and development and in organizations planning and administering programs of technological or scientific research and development. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 207 The Personnel Function for Engineering Administrators (3)
EAd 255 Administration of Research and Development (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (9–15)

CONSTRUCTION MANAGEMENT

Construction management encompasses managerial functions in an organization that plans and executes major construction work. This can take place in the field, in the project office, or in a main office. Due to the inherent complexity of present-day engineering, engineers need to know management as well as basic planning, design, and construction methods. They need to know construction developments, problems of contracts and specifications, techniques of scheduling and control, estimating, labor relations, and industrial or management psychology.

This program prepares the engineer for the task of marshalling men, materials, machines, and money as functions of time, cost, weather, and human nature to plan and build structures. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 241 Construction Management I (3)

EAd 242 Construction Management II (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (6–12)

ENVIRONMENTAL AND ENERGY MANAGEMENT

This program prepares students for positions in organizations involved with environmental, energy, and related resource management. This includes organizations conducting environmental control and energy conservation, and organizations planning and administering programs in energy resource development/utilization and in prevention and control of environmental pollution. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 221 Environmental Management (3)
EAd 222 Energy Management (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (6–12)

INFORMATION SYSTEMS MANAGEMENT

Managers of technological and scientific organizations encounter a variety of management information systems required for day-to-day operations and long-range decisions. This program helps to provide managers with the competence to use such systems effectively. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 251 Management of Computer Organizations (3)
EAd 254 Automatic Data Processing Systems (3)
EAd 295 Management of Technical Information (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
EAd 321 Management Information Systems (3)
Electives (3–9)

MARKETING OF TECHNOLOGY

As the American economy matures and Americans survey the spectrum of options available to them, it is apparent that scientific and engineering outputs must be sold in world-wide competition both at home and abroad. The trained specialist is becoming more important than ever before in performing the selling function.

The objective of this program is to prepare students for responsible positions in marketing technical products and services. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 293 Technical Enterprises (3)
EAd 294 Marketing of Technology I (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
EAd 311 Marketing of Technology II (3)
Electives (6–12)

TECHNOLOGY AND PUBLIC AFFAIRS

This program prepares students for responsible positions requiring managerial decision-making on matters that involve the impact of technology on public policy and that concern the general interrelationship between modern technology and public affairs. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
EAd 386 Advanced Topics in Management (3)
Electives (9–15)

TRANSPORTATION MANAGEMENT

This program prepares students for responsible positions in the management of transportation systems or in the formulation of transportation policy. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 265 Transportation Management I (3)
EAd 266 Transportation Management II (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (6–12)

MASTER OF SCIENCE DEGREE PROGRAM

Systems Analysis and Management

The Master of Science degree is offered to students specializing in Systems Analysis and Management. The program is administered by the Department of Engineering Administration, with the cooperation of the Department of Operations Research.

The systems viewpoint has been productive in the design of organizations and in detecting, analyzing, and solving organizational problems. It emphasizes the interconnectedness of elements and activities of a system, including personnel considerations. An increasing need exists for individuals who can apply the systems approach to organizational systems.

Analysis, synthesis, and management of organizations from the systems standpoint require a blend of studies from the areas of management science and operations research. Study of management science and operations research provides insights into organizations and their personnel, understanding of the viewpoints and techniques of managers with whom the system analyst or manager must interact, mathematical and statistical tools for the analysis and synthesis of systems, and scientifically based methods for detection, analysis, and solution of system problems. Consequently, a system analyst/manager utilizes a mathematical or nonmathematical formulation of information as appropriate to the situation. The increasing application of computers for management makes an understanding of their capabilities essential.

ADMISSION AND PREREQUISITES

In addition to the general requirements for admission to graduate study, applicants must meet the following requirements: (1) The applicant must have a basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computers. The requirements can be met by satisfactory completion of the following undergraduate courses* or approved equivalents: ApSc 115 and 116; EAd 150, 160; and CSci 100. (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition for admission. (3) The student is required to earn the grade of *C* or better (unless upon admission the requirement is stipulated to be a grade of *B* or better) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Science in Systems Analysis and Management, and unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

REQUIRED COURSES

Only a nonthesis program is offered

EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision-Making and Problem-Solving (3)
EAd 281 Systems Analysis and Management I (3)
EAd 282 Systems Analysis and Management II (3)
EAd 287 Systems Modeling and Simulation (3)
OR 201 Operations Research I (3)
OR 202 Operations Research II (3)

* Students may not earn graduate credit for these courses.

ELECTIVE COURSES

Two courses are to be selected from course offerings of the Department of Operations Research, normally from among the following:

OR 232 Applications of Linear and Nonlinear Optimization Theory (3)
OR 251 Linear Programming (3)
OR 262 Decision Analysis (3)
OR 271 Forecasting Techniques (3)
OR 277 Queuing Theory (3)
OR 279 Inventory Control (3)

One project course is to be selected from the following, according to the nature of the project chosen at the end of the period of study:

EAd 297 Problems in Engineering Administration (3)
OR 291 Problems in Operations Research (3)

PROFESSIONAL DEGREE PROGRAM

The Department of Engineering Administration has established the Professional degree program for those students who are interested in pursuing course work beyond the Master's degree, with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or to the degree of Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in engineering administration.

In the Professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Based on departmental requirements, each student's program is planned considering background and needs.

AREAS OF SPECIALIZATION

The Professional degree program provides post-Master's degree graduate study in areas in which the Department has adequate facilities and resources. Upon departmental approval, the student may select courses in other University departments to meet specific needs or objectives. Courses can, upon departmental approval, be chosen in the following areas:

Administration of Research and Development
Construction Management
Engineering Administration
Environmental and Energy Management
Information Systems Management
Marketing of Technology
Systems Analysis and Management
Technology and Public Affairs
Transportation Management

A student's program of study will provide concentration in a selected area, and include courses from other areas. A program consists of a minimum of 30 semester credit hours of approved graduate courses beyond a Master's degree, six of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of credit hours.

ADMISSION

Admission to graduate study toward the Professional degree requires appropriate bachelor's and Master's degrees from recognized institutions, and evidence of capacity for productive study. To study toward the Professional degree of Engineer (in Engineering Administration), an applicant must possess a bachelor's degree in engineering; for the Professional degree of Applied Scientist (in Engineering Administration), an applicant must possess a bachelor's degree in mathematics or a physical science. In both cases a Master's degree in engineering administration or a related field is required. Applicants having equivalent backgrounds of study may be considered. At least a 3.00 (B) average in graduate study is required.

Those applicants having Master's degrees in engineering, physical science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) with a grade of *B* or better.

Those applicants wishing to pursue study in Systems Analysis and Management must possess a Master's degree in systems analysis or a related field. Applicants having other Master's degrees must have a basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computers. The requirements can be met by satisfactory completion of the following undergraduate courses* or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition for admission.

ADMISSION TO CANDIDACY

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. No courses taken by the applicant to meet these prerequisite requirements and conditions can be applied toward the Professional degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of only 9 hours of this additional course work can, with the approval of the adviser, be applied toward meeting degree requirements.

TRANSFER CREDIT

Up to 6 semester credit hours of satisfactory study (with grades of *A* or *B*) in a graduate program beyond a Master's degree will be considered for transfer toward the Professional degree. Previously earned credits must have been earned within 5 years of admission to candidacy for the Professional degree, and must be appropriate to satisfy requirements for the Professional degree. The student must, with the approval of the adviser, petition the Department Chairman for such transfer.

PROGRAM OF STUDY

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the Comprehensive Examination, and Professional degree requirements. The pro-

*Students may not earn graduate credit for these courses.

gram of study for each student must be approved by the student's adviser and the Department Chairman. An area of concentration is selected to prepare the student to undertake the professional project. Other courses are selected either to support work on the planned projects or to meet other needs. With prior approval of the adviser, up to 9 credit hours of study may be taken in other departments of instruction if such work is pertinent to the program. These 9 hours include the 6 potential transfer credits.

PROFESSIONAL PROJECT

Each degree candidate must engage in a professional project on which the candidate will submit an acceptable report of an analysis and solution of a "real world" problem in engineering administration. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to determine a significant problem, to work toward a solution, and to communicate the results in writing.

When the course work is essentially completed, and with the adviser's approval, the candidate will register for EAd 395–96 *Seminar: Professional Project* (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study, and prepared a study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the Department Chairman for approval. Six semester credit hours are assigned for work on the professional project.

SCHOLARSHIP

No student studying for the Professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.00 *(B)* to receive the degree.

TIME LIMITS

A full-time student in the Professional degree program is allowed a maximum of 3 calendar years from the date of the student's first registration as a graduate student in prerequisite or graduate courses to complete all degree requirements. A part-time student in this program is allowed a maximum of 5 calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

RESIDENCE AND CONTINUOUS STUDY

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the Professional degree program under whatever conditions and regulations are in effect at that time.

DOCTOR OF SCIENCE DEGREE PROGRAM

Programs in Engineering Administration and in Systems Analysis and Management leading to the degree of Doctor of Science provide advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission

All applicants must meet the general requirements for admission to doctoral study stated on pages 34–35.

Applicants for doctoral study in Engineering Administration must have a Master's degree, with a superior record of academic achievement in engineering administration or a related field. Those applicants having Master's degrees in engineering, physical science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) with a grade of *B* or better.

Those applicants wishing to pursue Systems Analysis and Management must possess a Master's degree in systems analysis or a related field. Applicants having other Master's degrees must have a basic knowledge of probability and statistics, principles of management, engineering economic analysis, and computers. The requirements can be met by satisfactory completion of the following undergraduate courses* or approved equivalents: ApSc 115, 116; EAd 150, 160; and CSci 100. The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition for admission.

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing *all* course and language requirements, and qualifying examinations (see p. 34–38). No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the Doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of only nine hours of this additional course work can, with the approval of the adviser, be applied toward meeting degree requirements.

Transfer Credit

Up to 6 semester credit hours of satisfactory study, with grades of *A* or *B*, in a graduate degree program beyond a Master's degree will be considered for transfer toward the Doctoral degree. They must have been earned within the 5 years preceding admission for the Doctoral degree, and must be appro-

* Students may not earn graduate credit for these courses.

priate to satisfy requirements for the Doctoral degree. The student must, with the approval of the adviser, petition the Department Chairman for such transfer.

Programs of Study

Major fields leading to the degree of Doctor of Science are available in Engineering Administration and in Systems Analysis and Management. In addition to the major field, one or two minor areas of concentration are normally required, which may be chosen from the areas administered by this Department and/or from appropriate areas available in other departments of the University. The general requirements for doctoral study are stated on pages 34–38.

Upon admission, the student is assigned to a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the Qualifying Examination, and Doctoral degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of study is selected to prepare the student to undertake the dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on page 37. Once the Qualifying Examinations are satisfactorily completed, the candidate identifies an area or project to study and prepares a research proposal which includes consideration of the feasibility of the proposed research. The detailed project proposal is submitted for approval to the Department Chairman and a selected faculty member who will serve as the student's Director of Research. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 while the research is conducted.

Scholarship

No student studying for the Doctoral degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a cumulative quality-point average of at least 3.2 to receive the degree.

Time Limits

A full-time student in the Doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see page 38).

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the Doctoral degree program under whatever conditions and regulations are in effect at that time.

ENGINEERING ADMINISTRATION UNDERGRADUATE COURSES

150 Introduction to Engineering Administration (3)

The interrelationships of engineering, science, and management; conceptual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motivation of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to the complete management process studied in EAd 211–12. (Fall, spring, summer)

160 Introduction to Engineering Economic Analysis (3)

Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit/cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis. (Fall, spring, summer)

170 Basic Quantitative Methods for Engineering Administration (3)

An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability, statistics, and operations research. (Fall, spring, summer)

ENGINEERING ADMINISTRATION GRADUATE COURSES

204 Administration of Engineering Contracts (3)

Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services. (Fall and spring)

207 The Personnel Function for Engineering Administrators (3)

Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment. (Fall and spring)

210 Engineering Law (3)

Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engi-

neers, product liability, agency relationships, patent and proprietary rights, special problems in research and developmental contracts. (Fall and spring)

211–12 Engineering Administration (3–3)

Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150, 160, or equivalent. (Fall, spring, summer)

214 Patent Law (3)

A comprehensive and systematic introduction to the law of patents, trade secrets, trademarks, and copyright, including the preparation and prosecution of patent applications. Management decisions involving intellectual property rights. The role of the research administrator in preserving and perfecting legal rights in innovations. (Spring)

215 Ethical Issues in Engineering Administration (3)

Moral philosophy from which ethical considerations are derived; ethical issues and exemplary problems encountered in the administration of engineering and allied areas of human endeavor. Use of case study method to enhance student's ability to recognize ethical aspects of problem situations and to think analytically and synthetically about such aspects. (Spring)

221 Environmental Management (3)

The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment and the utilization of our resources. Review of governmental and industrial programs to combat pollution of the air, land, and water. Review of existing and pending legislation involving environmental and related energy matters; theoretical aspects of specific management problems; tools for assessing environmental impact; institutional designs; procedures for promoting public participation. (Fall)

222 Energy Management (3)

Designed for those interested in management of energy supply and demand including petroleum, natural gas, coal, nuclear, conservation, and unconventional forms. Topics include energy legislation; theoretical aspects of pricing and scarcity doctrine; instruments for energy policy; hard, soft, and balanced energy paths; social/legal/institutional barriers to new technologies in extraction, processing, and utilization. Attention is given to combating scarcity utilizing methods that have the least cost and environmental impact. (Spring)

231 Program Management (3)

Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases. (Spring)

241 Construction Management I (3)

Types of construction procurement; aspects of contracts and specifications important to project management; subcontracting; project income; insurance; bonds; mechanics' liens. (Fall)

242 Construction Management II (3)

Administration of construction projects: planning, scheduling, control, resource allocation, and least cost expediting (CPM and PERT techniques). Labor relations; project safety (OSHA). (Spring)

243 Construction Management III (3)

Managerial problems associated with construction; optimal contractor decision-making; modeling and systems approach to construction management; the search for projects; selection of projects; bidding strategy. (Fall)

251 Management of Information Processing Resources (3)

Advances in information processing technology (including data transmission) affords management many options in acquiring and using a variety of computer-based resources to support organizational objectives. Planning, organizing, acquiring, and controlling these resources are examined. The merits of time sharing, facilities management, in-house computer centers, service bureaus, centralization vs. decentralization, and the relationship to the management structure of the firm are discussed. Prerequisite: EAd 254, or equivalent. (Fall)

253 Production Management (3)

Planning, organizing, and control of production; forecasting techniques; material management; methods of loading and scheduling production processes; electronic methods in production control. Organization and administration of the plant engineering function with emphasis on maintenance control programs. (Spring)

254 Automatic Data Processing Systems (3)

Logic of computers, hardware and software, systems analysis for data processing applications, systems design, systems economics. Impact on decision-making, business, and society. (Spring)

255 Administration of Research and Development (3)

The study of technological innovation as a vital part of the acquisition process; the role of the technical administrator in utilizing organization, plans, and control to accomplish research and development objectives. (Fall and spring)

261 Economic Analysis in Engineering Planning (3)

Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy, and permission of instructor. (Fall and spring)

262 Finance for Engineers (3)

Exposition of the financial concepts encountered in engineering situations; financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, and capital formation. (Fall)

265 Transportation Management I (3)

Integration of social, technical, economic, and political considerations which shape transportation systems and their management. Course material focuses on industry and local, state, and federal government programs in transportation. A management study of a local, regional, or national system will be required. (Fall)

266 Transportation Management II (3)

Legal aspects of transportation systems and their management. (Spring)

269 Elements of Decision-Making and Problem-Solving (3)

Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Managerial economics. Model building, testing, solving. Replacement under certainty or risk. Control-general, control charts, sampling inspection. Experimentation to differentiate variables, build models-canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations. (Fall, spring, summer)

281 Systems Analysis and Management I (3)

The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. (Fall)

282 Systems Analysis and Management II (3)

Extension and elaboration of systems analysis techniques, including their application to industry, input-output structures, human behavior in organizations, and military situations. Prerequisite: EAd 281 or permission of instructor. (Spring)

283 Systems Engineering (3)

Concept of system structure and organization. Linear and nonlinear systems analysis; dynamics and stability of systems. Introduction to optimization methods and systems simulation techniques. (Fall, odd years)

285 Seminar: Administrative Problems (3)

Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit. (Fall and spring)

287 Systems Modeling and Simulation (3)

Introduction to systems modeling and simulation dealing primarily with industrial, organizational, and control models. Emphasis on analyzing the system performance and designing an improved system using analytical or simulation techniques. Prerequisite: EAd 281, 283 or equivalent, and permission of instructor. (Fall, even years)

288 Technology Issue Analysis—The Engineering Approach (3)

A seminar for technical managers who need the contextual background and intellectual basis for addressing technology issues in the public and private sectors. Technology impact analysis, technology forecasting, and the principles and practices of technology transfer are treated as elements of a systematic approach to informed choice and sound technology decisions. (Fall, odd years)

291 Structured Analysis of Management Problems (3)

Application of each phase of a structured problem-solving approach to small-scale management problems. Students will determine problem symptoms; define problems; select a problem; determine constraints on solutions and alternative feasible solutions; develop the solutions, select one, test the solution, plan controls on it, and plan its implementation. Prerequisite: EAd 269. (Spring, even years)

293 Technical Enterprises (3)

Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. For those within technical firms and those within government who depend on technical firms as suppliers. (Fall)

294 Marketing of Technology I (3)

Marketing industrial goods and high-technology projects; special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy. (Spring)

295 Management of Technical Information (3)

Needs and objectives of technical information systems, functions involved in technical information, storage and retrieval, abstracting, computer usage in technical information systems, system organization. Prerequisite: EAd 251 or permission of instructor. (Spring)

297 Problems in Engineering Administration (3)

Project course providing the student with the opportunity to apply the various concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. Open to Master's degree candidates in the department. (Fall, spring, summer)

298 Research (arr.)

Basic or applied research in engineering administration or systems analysis. May be repeated for credit. Open to Master's degree candidates in the department. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

311 Marketing of Technology II (3)

Continuation of EAd 294. Special attention to marketing research, negotiation, and international marketing. Required for Master's degree candidates in the Marketing of Technology program. Prerequisite: EAd 294 or permission of instructor. (Fall, even years)

321 Management Information Systems (3)

Study of the development and management of information systems used by middle and higher management of technological and scientific organizations, in the control of many facets of the organization at all managerial levels. Required for Master's degree candidates in the Information Systems Management program. Prerequisite: EAd 295 or permission of instructor. (Fall, even years)

386 Advanced Topics in Management (3)

Reading and discussion of classic and important recent literature concerning the philosophy and application of management principles. (Fall, odd years)

387 Technological Forecasting (3)

Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)

388 Cost Effectiveness (3)

Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost effectiveness studies, systems approach to cost effectiveness studies. (Spring, even years)

394 Advanced Study (arr.)

Limited to Departmental Professional degree students. May be repeated for credit. (As arranged)

395–96 Seminar: Professional Project (3–3)

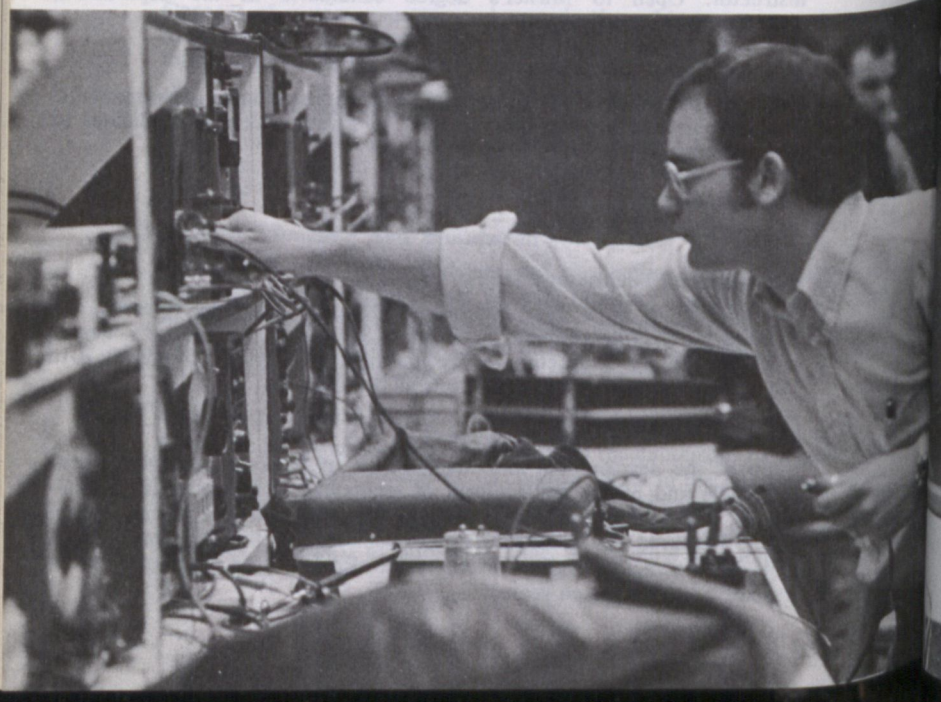
Limited to Professional degree candidates in the Department. (Fall and spring)

398 Advanced Reading and Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)



Operations
Research

Operations Research

Professors W.H. Marlow, D. Gross *(Chairman)*, N.D. Singpurwalla, A.V. Fiacco, G.P. McCormick, J.E. Falk, R.M. Soland

Adjunct Professor F. Frishman

Professorial Lecturers C. Anello, W.R. Nunn, B. Schwartz, S.C. Tignor, J.L. Horowitz, G.R. McNichols

Associate Professor D.R. Miller

Associate Professorial Lecturers J.W. Blankenship, D.R. Edmonds, P.L. Hayes

Assistant Professor Z. Barzily

Assistant Professorial Lecturers K.R. Hoffman, J.F. Ince, H.D. Kahn, P.F. McCoy, B.D. Nussbaum, J.A. Berning

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Programs in operations research lead to the degrees of Bachelor of Science, Master of Science, Doctor of Science, and to the Professional degree of Applied Scientist.

OPERATIONS RESEARCH AND COMPUTATIONAL SCIENCE PROGRAM—UNDERGRADUATE STUDY

Operations research and computational science is the application of scientific methods and engineering techniques to the solution of management problems, especially where the most efficient and effective use of resources is concerned. Its practitioners seek to observe, understand, and predict the behavior of man-machine systems so that the best decisions about these systems can be made.

Operations research and computational science, as an applied scientific discipline, has a body of specialized methods and theories that are used to design, analyze, and improve operational and managerial systems. It is actually an interdisciplinary field—a synthesis of many disciplines that has evolved into an interesting and exciting field of its own. It combines many of the techniques and theories of engineering, mathematics, computer science, statistics, management, and economics.

In today's complex technological world, those trained in operations research and computational science are increasingly called upon by managers and decision makers to help in the analysis and solution of the many-faceted problems that arise in such diverse areas as transportation, scheduling, distribution, production, inventory control, information systems, manpower planning, health care systems, crime and fire fighting, environmental planning, energy economics, system reliability, forecasting, and strategic planning. It is safe to say that people with such training are now being employed by every major corporation, every major government agency, and every major military command in the United States.

The significant features of operations research and computational science are a broad range of potential applications and a wide variety of scientific techniques that can be selected and combined for a multidisciplinary approach. These characteristics combine to make the profession a dynamic and vital one. Operations research and computational science should be seriously considered by those who are attracted to the use of mathematics, statistics, engineering, and science in solving decision problems of practical significance.

Core Curriculum

The first four semesters of work concentrate on the fundamentals of science and mathematics, and also include study in English, the humanities, and the social sciences.

During the last four semesters the student concentrates on the professional courses in operations research, computer science, engineering administration, mathematics, and statistics. In addition, an average of one technical elective per semester must be chosen, and the student may choose *sets* of electives that offer concentration in areas such as engineering, mathematics, statistics, or environmental science.

First Semester

CSci 51:	Applications of Computers (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
*Math 30–31:	Precalculus and Single-Variable Calculus I (3)
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	Single-Variable Calculus II (3)
Math 33:	Multivariable Calculus (3)
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
Chem 13:	General Chemistry (4)
Math 124:	Introduction to Matrix Theory (3)
or	
ApSc 115:	Engineering Analysis III (3)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3)

Fourth Semester

CSci 52:	Computers and Societal Problems (3)
ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
ApSc 115:	Engineering Analysis III (3)
or	
Math 124:	Introduction to Matrix Theory (3)
Phys 16:	Introduction to Modern Physics (3)
Elective:	Selected from humanities or social sciences (3)

*Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined precalculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

Fifth Semester

OR 101: Survey of Operations Research Methods I* (3)
EAd 150: Introduction to Engineering Administration (3)
ApSc 116: Engineering Analysis IV (3)
CSci 157: Machine and Assembly Language Programming (3)
CSci 158: Algorithmic Methods and High-level Languages (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

OR 102: Survey of Operations Research Methods II* (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
CSci 159: Programming and Data Structures (3)
Stat 118: Regression Analysis (3)
Elective: *One* technical elective selected from:
EE 11: Linear Networks I (3)
ME 126: Fluid Mechanics (3)
ME 131: Thermodynamics (3)
Math 113: Graph Theory (3)
Stat 188: Nonparametric Statistical Inference (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

OR 151: Linear Programming* (3)
Math 139: Advanced Calculus I (3)
Stat 187: Theory of Sampling (3)
Elective: *One* technical elective selected from:
Math 153: An Introduction to Numerical Analysis I (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
Elective: *One* technical elective selected from:
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
ME 176: Environmental Engineering Problems (3)
ME 191: Mechanical Design (3)
CE 193: Hydraulics (3)
CSci 151: Introduction to Systems Programming I (3)
Math 121: Introduction to Abstract Algebra I (3)

Eighth Semester

OR 191: Problems in Operations Research* (3)
Math 140: Advanced Calculus II (3)
Stat 117: Analysis of Variance (3)
Electives: *Two* technical electives selected from:
EE 32: Fields and Waves II (3)
EE 172: Control Systems Design (3)
EE 177: Electrical Energy Conversion (3)
ME 148: Thermodynamic Analysis (3)
ME 193: Engineering Systems Design (3)
CE 110: Introduction to Environmental Engineering (3)
CE 194: Environmental Engineering I: Water Supply and Resources (3)

* Undergraduates will register for the 100-level courses but will attend lectures for the corresponding 200-level courses; separate requirements and grading standards will be used.

CSci 156: Introduction to Systems Programming II (3)
Math 122: Introduction to Abstract Algebra II (3)
Math 154: An Introduction to Numerical Analysis II (3)
Math 157: Introduction to Complex Variable Theory (3)
Stat 188: Nonparametric Statistical Inference (3)

Postgraduate Work

Upon completion of the four-year program, the student may choose to study one more year and obtain a Master of Science degree in Operations Research. Graduates of the Operations Research and Computational Science curriculum are given two credits of advanced standing which are applicable to the master's program.

OPERATIONS RESEARCH UNDERGRADUATE COURSES

101 Survey of Operations Research Methods I (3)

Basic concepts and techniques of operations research as applied to problems in industrial, governmental, and military decision-making. Allocation models, including the simplex procedure of linear programming, transportation, and assignment models; queuing theory; inventory theory; game theory; and decision-making under uncertainty. Prerequisite: ApSc 115 and Math 33, or equivalent. (Fall and spring)

102 Survey of Operations Research Methods II (3)

Simulation, Monte Carlo techniques; networks; integer programming; introduction to nonlinear programming; dynamic programming; reliability and replacement. Prequisite: OR 101 or permission of instructor. (Fall and spring)

151 Linear Programming (3)

Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality problems; parametric linear programming and sensitivity analysis; transportation problems. Prerequisite: OR 101 or permission of instructor. (Fall and spring)

191 Problems in Operations Research (3)

Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. Prerequisite: knowledge of FORTRAN or BASIC. (Fall and spring)

199 Honors Research (3)

As arranged.

ASTER OF SCIENCE DEGREE PROGRAM

ne objective of the Master's program in operations research is to prepare stunts with appropriate undergraduate backgrounds for in-depth study of analytally oriented techniques of management decision-making and applications of ese techniques.

Expanded scientific, statistical, and mathematical knowledge, combined with owing needs in technological as well as social areas, has created increased mand for individuals trained in operations research. The discipline of oper-

ations research uses scientific principles supported by statistical and mathematical methodology to study the function and structure of complex industrial, military, and social systems in an effort to evaluate the probable effects of proposed courses of action, to establish criteria to judge the effectiveness of these courses, and to assist in the making of optimal decisions. The program in operations research provides a scientific basis for solving problems involving the interaction of many factors and organizational components in the interest of the whole system. This breadth of interest is an example of the "systems approach" in the sense that a system is an interconnected complex of functionally related components. Most operations research efforts begin with specific aspects of a general problem and proceed to consideration of the system as a whole. Just as the engineer may start with the study of subsystems or components of a general problem, so may the operations research analyst.

Admission

In addition to the requirements for admission to graduate study (see pages 27–28), the applicant for the program in operations research leading to the Master of Science degree must have an adequate knowledge of probability and statistics. This requirement can be met by satisfactory completion of ApSc 115 and 116, or approved equivalents. It is generally possible to take these courses concurrently with courses taken for graduate credit; however, these undergraduate courses do not fulfill any part of the requirements for the Master's degree.

Required Courses

Core courses required in the field of operations research are OR 201, 202, 209, 210, and 299–300 (for those electing a thesis) or 291 (for those not electing a thesis). Students must complete OR 201, 202, 209, and 210 before attempting any other courses; however, in certain cases permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of the program. The remainder of the program is selected, with the approval of the adviser, in an area of concentration from courses in the Department of Operations Research. Appropriate courses from other departments of the University may also be approved as electives.

Areas of Concentration

The goal of the Department of Operations Research is to provide programs flexible enough to accommodate both those students who are interested in applications and those who are interested in theory. Specific areas of concentration and suggested departmental electives follow:

GENERAL OPERATIONS RESEARCH

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 261: Theory of Games
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, other courses within the Department may be elected.

ENERGY SYSTEMS

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

LOGISTICS ENGINEERING

OR 237: Logistics Planning
OR 251: Linear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 275: Introduction to Scheduling
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Economics, Business Administration, Management Science, and Electrical Engineering and Computer Science.

MANAGEMENT SCIENCE

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Departments of Business Administration, Economics, Engineering Administration, and Management Science.

MATHEMATICAL MODELING IN INFORMATION SYSTEMS

OR 251: Linear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the Departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

MATHEMATICAL OPTIMIZATION

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 253: Integer, Network, and Dynamic Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from applied science offerings and the Department of Mathematics.

MODEL BUILDING FOR TRANSPORTATION FLOWS

OR 231: Theory of Traffic Flow
OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning; and from the National Law Center.

OPERATIONS RESEARCH IN INDUSTRIAL ENGINEERING SYSTEMS

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

QUANTITATIVE DECISION-MAKING FOR PUBLIC POLICY

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

STOCHASTIC MODELING

OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

PROFESSIONAL DEGREE PROGRAM

This program of advanced study and research leads to the degree of Applied Scientist. The program is designed to provide an educational opportunity for students interested in pursuing post-Master's study with emphasis on applied subject matter rather than on basic research.

Admission

In addition to the general requirements for admission to Professional degree study (see pages 32–33), admission requires an appropriate Master's degree from a recognized institution and evidence of a capacity for productive work as indicated by prior scholarship. The applicant must also possess a bachelor's degree in either engineering, mathematics, or administration. In certain cases, applicants having an equivalent quantitative background may be considered for admission by the Department.

Program of Study and Requirements

The program of study consists of an applied operations research major and an applied out-of-Department minor. A minimum of 30 semester hours is required to earn the Professional degree. This 30-hour minimum includes (a) a minimum of 12 hours in operations research, (b) Stat 201–202, (c) a three-hour professional degree project (OR 391), and (d) a nine-hour applied minor in a field other than operations research. Appropriate minor areas include economics; engineering administration; systems analysis; computer science; systems science, networks and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems.

DOCTOR OF SCIENCE DEGREE PROGRAM

Programs in operations research leading to the degree of Doctor of Science provide advanced study and research to enable students to extend their fields of knowledge and to enhance their career opportunities in research, analysis, management, administration, or education.

dmission

n addition to the general requirements for admission to doctoral study (see ages 34–35), the applicant for the doctoral program in operations research ust have a Master's degree, with a superior record of academic achievement. utstanding professional performance is also considered in evaluating applints.

ograms of Study

ctoral programs are planned so that the student may obtain adequate breadth operations research and sufficient depth in areas of specialization which will ble the completion of a dissertation that will be a significant contribution to field. Possible areas of study include mathematical programming, multieria decision making, inventory, queuing, and reliability. In addition to major in operations research, two minor areas of concentration are normally

required. One minor generally is in applied science, mathematics, or statistics. The second minor may be chosen from within the Department or from appropriate other departments of the University, such as Business Administration; Civil, Mechanical, and Environmental Engineering; Economics; Electrical Engineering and Computer Science; Engineering Administration; Health Care Administration; Management Science; and Urban and Regional Planning. The general requirements for doctoral study are stated on pages 34–38.

PROFESSIONAL FIELDS AND RESEARCH INTERESTS OF OPERATIONS RESEARCH FACULTY

	Areas of Specialization	Areas of Recent Research
Zeev Barzily	Applied probability Queuing theory Stochastic processes	GI/G/1 queues Traffic models Detection of shift in transition probabilities of Markov chains
James E. Falk	Mathematical programming Numerical methods Mathematical modeling	Nonconvex programming Sequential optimization problems Sequential games Application of optimization methods to economics, military, logistics, and location problems
Anthony V. Fiacco	Mathematical programming Numerical methods Mathematical modeling	Penalty function methods Approximation and sensitivity analysis in nonlinear programming Construction and validation of algorithms Nonconvex programming techniques General applications
Donald Gross	Inventory theory Queuing theory Simulation	Queuing approximations Inventory models Applications Risk analysis
W.H. Marlow	Mathematical methods and numerical procedures in operations research and management science	Logistics Systems effectiveness

Garth P. McCormick	Mathematical programming Numerical methods Mathematical modeling	Rate of convergence of algorithms Nonconvex programming Mathematical programming applied to pollution problems and conservation of resources Energy modeling
Douglas R. Miller	Applied probability Stochastic processes Simulation Mathematical statistics	Risk analysis Avionics maintenance models Bounds and approximations for stochastic models Statistical inference using empirical distributions Stochastic models in polymer engineering Algorithms for solving queuing models
Nozer D. Singpurwalla	Applied probability and mathematical statistics Reliability theory and applications Time series analysis and forecasting Fault tree analysis	Applications of time series analysis to reliability problems Bayesian theory and methodology Extreme value theory and applications Nonparametric characterizations of distributions and their testing Models in air pollution and flood discharges
ichard M. Soland	Mathematical modeling Decision theory Mathematical programming	Optimal facility location Interactive multicriteria optimization Multicriteria decision models in the public and private sectors Solution and applications of the generalized assignment problem Risk analysis

ERATIONS RESEARCH GRADUATE COURSES

201 Survey of Operations Research Methods I (3)

Basic concepts and techniques of operations research as applied to problems in industrial, governmental, and military decision-making. Allocation models, including the simplex procedure of linear programming,

transportation and assignment models; queuing theory; inventory theory; game theory; and decision-making under uncertainty. Prerequisite: ApSc 115 and Math 33, or equivalent. (Fall and spring)

202 Survey of Operations Research Methods II (3)

Simulation, Monte Carlo techniques, networks, integer programming, introduction to nonlinear programming, dynamic programming, reliability and replacement. Prerequisite: OR 201 or permission of instructor. (Fall and spring)

209 Mathematics in Operations Research I (3)

Fundamental methods and practical procedures for deterministic decision models in operations research involving a number of variables. Applications of linear models for resource allocations. Applications to data representation and algorithmic procedures for linear and nonlinear optimization models. Applications of linear algebra and real multivariate analysis. Prerequisite: Math 33 or equivalent. (Fall and spring)

210 Mathematics in Operations Research II (3)

Fundamental methods and practical procedures for stochastic decision models in operations research involving applications of complex variables. Applications of linear differential, difference, and differential-difference systems to various areas in operations research. Applications of modern numerical methods. Prerequisite: Math 33 or equivalent. (Fall and spring)

231 Theory of Traffic Flow (3)

Definitions and measurement of traffic stream parameters, dynamic theories: follow-the-leader models of traffic flow, kinematic theories and fluid analogies, traffic cybernetics, statistical distributions and queuing theory, stochastic approaches to static delay problems, simulation of traffic problems. Prerequisite: ApSc 115 and Math 33, or equivalent. (Spring, odd years)

232 Applications of Linear and Nonlinear Optimization Theory (3)

Introduction to penalty-function methods for solving linear and nonlinear optimization problems through use of existing computer codes. Formulation of optimization models in application areas of structural design, nutrition, pollution control, inventory control, energy, economics, psychology, statistics, and chemical processes. Admission by permission of instructor. Prerequisite: Math 33 or equivalent. (Fall)

237 Logistics Planning (3)

Quantitative methods in model building for logistics systems including organization, procurement, transportation, inventory, maintenance, and their interrelationships. Applications stressed. Prerequisite: ApSc 115 and Math 33, or equivalent. (Spring, even years)

251 Linear Programming (3)

Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality problems; parametric linear programming and sensitivity analysis; transportation problems. Prerequisite: OR 201 or permission of instructor. (Fall and spring)

252 Nonlinear Programming I (3)

Basic topics in optimization theory, including first- and second-order optimality criteria, convexity, duality, and algorithms. Methods for solving unconstrained, linearly constrained, and nonlinearly constrained problems. Applications discussed where appropriate. Prerequisite: OR 202 or permission of instructor. (Spring)

253 Integer, Network, and Dynamic Programming (3)

Methods and applications of optimization problems requiring integral solutions. Cutting plane methods, branch and bound methods, group theoretic methods. Dynamic programming. Network programming: shortest route problems, max flow problems. Prerequisite: OR 202, 251; or permission of instructor. (Fall, even years)

261 Theory of Games (3)

Study of mathematical models with applications to the relationships among independent competitive entities (persons or organizations in environment of competition, bargaining, bidding), selection of optimum strategies, minimax concept, connections with linear programming and decision functions, two-person and n-person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)

262 Decision Analysis (3)

Study of decision making under certainty and uncertainty, and under one and several criteria. Topics include decision analysis and decision trees, the value of information, subjective probability and Bayesian statistics, utility and value theories, multiple criteria decision making and multiple criteria optimization, goal programming, and group decision making. Some specific applications and practical aspects of decision making will also be treated. Prerequisite: ApSc 116, OR 201, and 202; or permission of instructor. (Spring, odd years)

271 Forecasting Techniques (3)

Introduction to various techniques of forecasting available to an operations research analyst or engineer. Topics include the use of regression analysis in forecasting and other heuristic forecasting techniques. Emphasis on detailed development of the Box-Jenkins technique for time-series analysis, including moving averages and exponential smoothing as special cases. Techniques covered will be applied to engineering, business, and economic situations, using special computer program packages. Prerequisite: ApSc 115, 116; or equivalent. (Fall, odd years)

273 Digital Systems Simulation (3)

Monte Carlo techniques, random number and random deviate generation. Simulation languages. Operating considerations, including model validation, steady-state, and statistical analyses of simulation output. Applications in inventory, queuing, and production scheduling. Prerequisite: OR 201, 202, or permission of instructor; and knowledge of FORTRAN or BASIC. (Spring)

275 Introduction to Scheduling (3)

Theory of scheduling with emphasis on industrial applications, assembly line balancing, sequencing and scheduling of jobs in machine shops. Mathematical optimization, heuristic programming, and computer simulation approaches to these problems are examined. Prerequisite: OR 201, 251; or permission of instructor. (Spring, even years)

277 Queuing Theory (3)

Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth-death processes, finite sources, bulk queues, Erlangian models, and series queues. Models with general arrival and/or service patterns. Model-building, basic solution techniques, and formal theoretical developments are stressed. Prerequisite ApSc 116, OR 201; or permission of instructor. (Spring)

279 Inventory Control (3)

Application of mathematical techniques to decisions regarding when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints. Demand uncertainty and forecasting in inventory models. Prerequisite: OR 201 or permission of instructor. (Fall)

281 Reliability Theory I (3)

Topics introducing the mathematical and statistical theories of reliability. Mathematical theory includes the theory of coherent structures, association of random variables, stochastic characterization of wear, total positivity, preservation theorems, and bounds and inequalities. Statistical theory includes probabilistic derivation of failure models; testing goodness-of-fit; censored, truncated, and sequential life testing procedures using classical and Bayesian techniques; testing reliability hypotheses and their applications in the commonly used military standard plans. Prerequisite: ApSc 115, 116; or equivalent. (Fall)

291 Problems in Operations Research (3)

Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. Prerequisite: Knowledge of FORTRAN or BASIC. (Fall and spring)

297 Special Topics in Operations Research (3)

Selected topics in operations research, as arranged. Prerequisite: permission of instructor. May be repeated for credit.

298 Research (arr.)

Basic or applied research in operations research. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

351 Advanced Topics in Mathematical Programming (3)

Special topics selected from fractional and geometric programming, branch-and-bound methods, max-min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring)

352 Nonlinear Programming II (3)

Convex analysis, algorithmic convergence, and rate of convergence. Proofs of optimality conditions. Factorable programming and other problems with special structures. Matrix methods, sensitivity analysis, and nonconvex optimization. Prerequisite: OR 252 or permission of instructor. (Fall)

371 Advanced Topics in Forecasting (3)

Continuation of OR 271 designed for those who wish to develop further capability in this area. Topics include a brief review of OR 271, estimation of parameters of Box-Jenkins models, transfer function models for relating two or more time series, models for intervention analysis, and models for feedforward and feedback control schemes. Also, other techniques and concepts useful in forecasting, such as spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271 or equivalent, or permission of instructor. (Spring, even years)

377 Advanced Stochastic Models in Operations Research (3)

Selected applied probability models, including Brownian motion, renewal theory, denumerable Markov chains, semi-Markov processes, and Markov decision problems. Applications to topics in advanced queuing and inventory theories, including busy periods, waiting times, imbedded Markov chains, and GI/G/1 queues; and conditions for optimality of (s, S) policies, stochastic leadtime problems, state-dependent leadtimes, and multi-echelon problems. Prerequisite: OR 277, 279; or permission of instructor. (Fall)

381 Reliability Theory II (3)

Topics of current interest in the mathematical and statistical theories of reliability. Mathematical theory includes stochastic characterization of multivariate survival, shock models and wear processes, stochastic majorization and its applications, and reliability theory for multi-state components. Statistical theory includes total time on test processes and plots, goodness-of-fit tests using total time on test plots, estimation and forecasting failure rates, and comparison of stochastic processes. Prerequisite: OR 281. (Spring, odd years)

391 Project for Professional Degree (3)

Limited to students in the Professional degree program. (Fall and spring)

397 Advanced Topics in Operations Research (3)

Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Required Courses in Engineering Undergraduate Curricul Offered by Columbian College of Arts and Sciences and by th Graduate School of Arts and Sciences

For convenience, descriptions of required courses in undergraduate curricul which are offered by Columbian College of Arts and Sciences and the Gradua School of Arts and Sciences are listed here. See the *Undergraduate and Gra uate Bulletin* for elective courses in the humanities and social sciences.

BIOCHEMISTRY

221–22 **General Biochemistry** (3–4)

A comprehensive course in general biochemistry for graduate student in biomedical sciences and undergraduate students in biology and chem istry. Generally, graduate students *must* register concurrently for Bioc 223 and for Bioc 224. However, graduate students taking Bioc 225–26, For 281–82, Micr 241–42, or Phys 223–24 may register for Bioc 221–22 with out the laboratory. With specific recommendations by the undergraduat adviser and the Department, undergraduate students may register for Bio 221–22 without the laboratory. Prerequisite: Chem 152, 154. (Aca demic year)

BIOLOGICAL SCIENCES

Biology

11–12 **Introductory Biology for Science Majors** (4–4)

Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts and principles are demonstrated through consideration of the plant as an organism. BiSc 12: Beginning principles of inheritance, development, behavior, physiology, systematics, and evolution, using animals as the subject of investigation; designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Ma terial fee, $24 a semester. (Academic year)

Zoology

145 **Introduction to Vertebrate Embryology** (4)

Lecture (2 hours), laboratory (4 hours). Origin and early development of the individual, formation of organ systems. Emphasis on frog, chick, and pig, with reference to human embryo. Material fee, $24. (Fall)

148 **Histology** (4)

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrela tionship of structure and function. Material fee, $24. (Fall and spring)

CHEMISTRY

13 **General Chemistry** (4)

For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical

bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry; organic chemistry. Prerequisite: Math 31, Phys 14 or 15. Laboratory fee, $28. (Fall)

22 Introductory Quantitative Analysis (4)

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28. (Fall and spring)

151–52 Organic Chemistry (3–3)

Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 Organic Chemistry Laboratory (1–1)

Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $28 a semester. (Academic year)

ENGLISH

***9 English Composition: Language as Communication** (3)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure in writing paragraphs; also includes content covered in Engl 10. Class meets five hours per week and carries three semester hours of credit. Special fee, $25. (Fall and spring)

***10 English Composition: Language as Communication** (3)

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

GEOLOGY

136 Engineering Geology (3)

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31, Phys 2 or 4; or permission of instructor. (Spring)

MATHEMATICS

†30–31 Precalculus and Single-Variable Calculus I (3)

A one-semester combination of Math 30 *Precalculus* and Math 31

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* Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores and/or writing skill indicate superior competence will be allowed to waive the Engl 10 requirement.

† Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

Single-Variable Calculus I. The course meets five hours per week and carries three semester hours of credit. After completing the first half of the course (Precalculus), students are examined in precalculus. Students who pass the test continue in Math 30–31. Students who fail the test transfer to a regular Math 30 course for the remainder of the semester. (Fall and spring)

30 Precalculus (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. (Fall and spring)

31 Single-Variable Calculus I (3)

Differentiation and integration of algebraic functions, exponentials and logorithms with simple applications. Analytic geometry. Prerequisite: Math 30 or equivalent. (Fall and spring)

32 Single-Variable Calculus II (3)

Calculus of trigonometric functions. Techniques of integration. Indefinite series; vectors; three-dimensional analytic geometry. Prerequisite: Math 31. (Fall and spring)

33 Multivariate Calculus (3)

Vector-valued functions. Partial differention. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

32–33 Single-Variable Calculus II and Multivariate Calculus (6)

A one-semester combination of Math 32 and 33, meeting five hours per week.

113 Graph Theory (3)

Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 Introduction to Abstract Algebra (3–3)

Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

124 Introduction to Matrix Theory (3)

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor. (Fall and spring)

139 Advanced Calculus I (3)

Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall and spring)

140 Advanced Calculus II (3)

Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent. (Spring)

153 Introduction to Numerical Analysis (3)

Introduction to fundamentals of numerical analysis using modern digital computers. Solution of linear systems and of ordinary differential equations. Interpolation polynomials. Iterative solution of nonlinear equations. Simple quadrature techniques. Prerequisite: Math 33 or equivalent. (Fall, even years)

154 Difference Equations (3)

Introduction to finite difference equations and their solution. Physical examples and analogies with differential equations are employed to motivate and apply the techniques developed. Generating functions. Analysis of error and stability characteristics. Prerequisite: Math 111 or 139; or equivalent. (Spring, odd years)

157 Introduction to Complex Variable Theory (3)

Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

PHYSICS

3 Foundations of Physics (3)

Lecture (2 hours), recitation (1 hour). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat and electromagnetism, including the classical concepts of energy, momentum, heat, temperature, entropy, electric and magnetic fields, optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. (Fall, spring, summer)

14 Introductory Mechanics and Thermal Physics (3)

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18. (Fall, spring, summer)

15 Elements of Electricity and Magnetism (3)

Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's law, Gauss' Law, electric potential, capacitance and dielectrics, electric current and resistance. Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18. (Fall, spring, summer)

16 Introduction to Modern Physics (3)

Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to basic principles of quantum theory. Topics include wave-par-

ticle duality, the hydrogen atom, Pauli's exclusion principle, X-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisite: Phys 14, 15, Math 32. Laboratory fee, $18. (Fall, spring, summer)

STATISTICS

117 Analysis of Variance (3)
Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance; random block, factorial, Latin square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee, $18. (Spring)

118 Regression Analysis (3)
Lecture (3 hours), laboratory (1 hour). Regression and correlation theory; simple, partial, and multiple. Prerequisite: 3 semester hours selected from Stat 51, 53, 91. Laboratory fee, $18. (Fall and spring)

159 Principles of Bayesian Statistics (3)
Lecture (3 hours), laboratory (1 hour). Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: three semester hours in introductory statistics, or equivalent. Laboratory fee, $13.

187 Theory of Sampling (3)
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 Nonparametric Statistical Inference (3)
Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)

GENERAL INFORMATION

Registration

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

New and readmitted students cannot register for classes without having received a letter of admission to the University issued by the appropriate admitting office.

No registration is accepted for less than a semester or less than one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which the student is registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, prior to registration. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

ELIGIBILITY FOR REGISTRATION

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student.—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student.—A student previously registered in the University who was not registered for campus courses during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before the student is eligible for registration.

Continuing Student.—The student registered for campus courses in the immediately preceding semester or the Summer Session preceding the fall semester is eligible to register, assuming good standing and enrollment in a continuing program.

COMPLETION OF REGISTRATION

Registration is not complete until financial settlement is made. Attendance in class is not permitted until registration has been completed.

REGISTRATION CHANGES AND WITHDRAWALS (see pages 217–18, 225)

Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc. should consult the program announcements of the other institutions. Consortium application forms and instructions may be picked up in the Office of the Registrar after obtaining registration materials. In order to participate in the Consortium program, students must obtain the approval of an adviser and should ascertain from the department of the institution where the course is taught whether they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the Registrar.

Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1981 summer sessions and the 1981–82 academic year.

Tuition Fees

For undergraduate study:

Full-time program (12 or more hours per semester)	$2,150.00
Part-time program, for each semester hour	160.00
Summer Sessions, for each semester hour	145.00

For graduate study*

Each semester hour for which the student registers	160.00
Summer Sessions, for each semester hour	145.00

Doctoral students are required to register for minimum hour-loads,† as follows:

1. Full-time doctoral students must register for a minimum of 12 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.
2. Part-time doctoral students must register for a minimum of 6 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and for a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.

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* Registration in thesis courses (299-300) entitles the student, during the period of registration, to the advice of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished an additional semester will be granted. If the preparation of the thesis extends beyond the three-semester period, approval for this extension will be required, and the student must repeat the thesis course 300 and pay tuition as for a repeated course, provided the overall time limit for earning the degree is not exceeded.

† No minimum hour-load is required during the summer sessions.

Future Tuition Increases—The University has had a policy of projecting tuition increases for four years in advance; however, the uncertainty of current economic conditions will not permit continuance of this policy. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound educational basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition may be required.

University Center Fee

(Charged all students registered on campus)
For students registered for 11 or more semester hours:
Each semester $55.50

For students registered for less than 11 semester hours:
Each semester hour $5.25

Additional Course Fees

In certain courses additional fees, such as laboratory and material fees, are charged as indicated in the course description. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. Breakage of apparatus is charged against the individual student. When breakage is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Graduation Fees

All degrees offered by the School of Engineering and Applied Science..... $25.00
Fee for binding Master's thesis 15.00
Fee for microfilm service and printing announcement of final examination for Doctoral degree 65.00

Residence Hall Fees (see page 234).

Special Fees and Deposits

Application fee (undergraduate degree candidates) nonrefundable $15.00
Application fee (graduate degree candidates), nonrefundable..... 25.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student 100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space 100.00
Admission tests (when required) 6.00–12.00
Late-registration fee, for failure to register within the designated period.... 15.00
Late-payment fee, for failure to make payments when due (see "Payment of Fees" below) 15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees" below) 35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason..... 15.00
Engineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof except the summer term 5.00
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both 25.00

For each waiver examination to qualify for advanced placement	5.00
English test for international students (when required)	10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the date deadline set by the instructor*	10.00
Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the services of the Student and Alumni Career Services Office; (2) the use of the University Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *University Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University, with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of eight per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $750 or more. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of eight per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits his right to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settle-

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next regular laboratory period.

ment will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

Returned Checks

A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student will forfeit all rights to check cashing at the University, and future payments for tuition, dormitory, food service, and other special fees will require payment by cash, certified check, or money order.

PREPAID AND DEFERRED PAYMENT PLANS FOR PARENTS

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301
4. School-Chex, Irving Trust Company, P.O. Box 12231, Church St. Station, New York, N.Y. 10249.

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule are made by completing the George Washington University Change Slip (obtainable in Room 103, Tompkins Hall), securing the approval of the appropriate faculty, and submitting the form to Room 103 for the dean's signature. Notification to an instructor is not an acceptable notice (see "Withdrawal," page 225.)

Withdrawal and Change in Course Status

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, and the Associate Dean.

The status of a course may not be changed from credit to audit or vice-versa after the 28th day after classes have started for the semester.

For other regulations governing withdrawal and changes in program, see page 225.

*Regulations concerning withdrawals and refunds for the Summer Sessions are stated in the *Summer Sessions Schedule of Classes.*

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:
   Withdrawal dated on or before Saturday of the *first* week of classes....90%
   Withdrawal dated on or before Saturday of the *third* week of classes....75%
   Withdrawal dated on or before Saturday of the *fifth* week of classes....50%
   Withdrawal dated after the fifth week of classes .....none
2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student,* the above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. A student who is granted leave before completing the semester will receive credits for current charges in accordance with the schedule for complete withdrawal from the University (see No. 1, above). Payments made in excess of the nonrefundable balance will be refunded to the student.
5. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid*

FOR UNDERGRADUATE STUDENTS

George Washington University offers a program of financial assistance of two basic types: awards for academic achievement without reference to financial circumstances—honor scholarships; and scholarships, grants, loans, and employment based upon demonstrated financial need. Applicants may apply for only *one* type of aid: need-based or honor.

Academic Merit Only

Engineering Honors Scholarships (EHS)

This program was initiated to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of merit only and "financial need" is not a requirement for consideration. Applicants with financial need should apply for need-based aid, *not* for EHS. The EHS is available to entering freshmen and

* For information concerning financial aid for students from foreign countries, see page 223.

to transfer students who have (or will have by the time of entrance to SEAS) compiled 30 credit hours of college-level work which includes 6 credit hours of calculus or higher math and 3 credits of either physics or chemistry.

These scholarships cover one-half the tuition costs of attending SEAS and will be awarded to qualified students for up to four years, as long as scholarship criteria are met with the option of a fifth year if the student wishes to obtain a Master's degree.

Minimum Criteria for Initial Consideration of Incoming Freshman

The minimum criteria in the EHS Program will be based on merit in which the student has:

—achieved a minimum combined SAT score of 1250 or better; or an average ACT score of 28 or better in the English/mathematics/science tests; and ranked in the upper 10% of the class over 3 years or more;

or

achieved a minimum combined PSAT score of 125 or better;

—ranked at the end of the junior year in the upper 10% of the class over a period of 3 years or more;

—achieved an average grade of 85%, or better, at the end of the junior year, in mathematics and science courses taken during the previous 3 years.

Minimum Criteria for Initial Consideration of Incoming Transfer Students

The minimum criteria in the EHS Program will be based on merit in which the student has:

—completed (or will have completed at the end of the present semester) 30 credit hours in an accredited community college, college or university;

—completed courses which must include, at least, 6 credit hours of college calculus or higher mathematics, and, at least, 3 additional hours of college level physics or chemistry;

—achieved an overall quality point index of at least 85% (3.4) and a combined average of 80% (3.2) in the mathematics and science courses.

Need-Based Financial Aid

The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the National Direct Student Loan, Basic Educational Opportunity Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid other than Engineering Honors Scholarships must be filed by February 1 (entering freshmen) or March 3 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 3 for the spring semester; and by April 1 for the summer sessions.* A student must reapply for financial aid each year.

Application deadlines for Engineering Honors Scholarships vary according to the category of student. Applicants with financial need should apply for

*Summer Sessions students are eligible for consideration only if they were enrolled in this University at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester.

need-based aid, *not* for EHS. Information on deadline dates is contained in the application forms.

Information concerning financial assistance is contained in the pamphlet, "Financial Aid Opportunities for Undergraduate Students at the George Washington University, School of Engineering and Applied Science," which is available at the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry at least 15 credit hours per semester in subjects related to the degree program during the period for which the scholarship is awarded. Most of the following scholarships are limited to students in the School of Engineering and Applied Science. The University also offers other scholarships which are open to engineering students.

Frederick Albert and Alma Hand Britten Scholarships (1959)—Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Available for undergraduate and graduate study.

American Association of Cost Engineers Scholarship (1977)—Established by American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum which includes courses related to cost engineering.

Atlantic Research Corporation Scholarship (1979)—Established by the Atlantic Research Corporation for both graduate and undergraduate students. The scholarship for undergraduates includes full tuition, books, and fees for students in their senior year only. Graduate students receive full tuition, books, and fees for one year of full-time graduate work. Recipients of the award must have an overall *B* average and must agree to accept employment with Atlantic Research Corporation for one year after graduation. Awards are offered both on a financial-need and a non-financial-need basis.

Henry Harding Carter Scholarship (1896)—Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

Henry Parsons Erwin Scholarship (1955)—Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in Engineering and Applied Science.

Louis E. Giles Memorial Scholarships (1966)—Bequest of Susie E. Giles in honor and memory of her husband for scholarships to undergraduate and graduate students in the School of Engineering and Applied Science requiring financial assistance.

The George Hyman Construction Company Scholarships (1974)—Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial tuition undergraduate scholarships begin in the fall semester and extend for four years, provided the holder maintains a *B* average based upon a full course load leading to a degree in civil engineering and continues to be in financial need.

National Fund for Minority Engineering Students Scholarship (1977)—Scholarship for minority students who require financial assistance of up to $2000 and are in good academic standing. Minority students are defined as full time students of black, Puerto Rican, American Indian or Chicano descent, who are U.S. citizens or permanent residents, and who are entering an engineering school or university for the first time.

George Washington University Board of Trustees Scholarships—Full and partial tuition undergraduate scholarships which begin in the fall semester and extend for four successive academic years, provided the holder maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a Bachelor's degree.

FOR GRADUATE STUDENTS

Scholarships, Fellowships, Assistantships

The George Washington University program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. Application for admission to graduate study is a prerequisite for consideration.

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the department concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, the application and supporting credentials **should be submitted not later than February 1 preceding the academic year for which the award is made.**

Frederick Albert and Alma Hand Britten Scholarships (1959)—See p. 220.

American Association of Cost Engineers Scholarship (1977)—See p. 220.

Louis E. Giles Memorial Scholarships (1966)—See p. 220.

Phi Delta Gamma Scholarship Endowment Fund (1968)—Established by the Beta Chapter of Phi Delta Gamma, national fraternity for graduate women. For graduate women students.

National Science Foundation Graduate Fellowships—Fellowships leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and social sciences, and in the history and philosophy of science; providing tuition, fees, and stipends. Open to students who have been admitted to graduate status and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

Research Assistantships in Operations Research and Related Fields—Available to graduates, and to undergraduates on the junior and senior levels, in any school of the University. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program or in programming or in conducting individual research on an approved research project. Stipends range up to $8,500, depending on the status of the student and the tenure of the appointment (9–12 months). Application deadline is March 1. Further information and applications are available from Director, Institute for Management Science and Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Research Assistantships in Engineering Administration—Available to graduates in any Engineering Administration program. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program. Stipends range up to $8,500 depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from the Chairman, Department of Engineering Administration.

Research Scholar Assistantships, GWU/NASA-Langley Program—See pages 40–43.

Resident Assistantships (men and women)—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part-time, and staff members are required to enroll as full-time students in degree granting programs. Further information may be obtained from the Office of the Director of Housing.

SPONSORED AWARDS FOR GRADUATE STUDY

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others which may be used in support of graduate study is available at the Graduate Fellowship Information Center, 2025 H St., N.W., for students enrolled at George Washington University. Information is also available on distinguished programs such as the Rhodes, Marshall, National Science Foundation, Fulbright, Rotary International, and Danforth as well as many others.

Since deadlines for application vary, qualified students should make inquiries well in advance of the year of planned graduate study.

LOAN FUNDS

Several loan funds are available to students in the University in accordance with the qualifications specified by the donors. Two loan programs limited to students in the School of Engineering and Applied Science are available. Students should direct inquiries to and file applications with the Office of Student Financial Aid. Applications for the National Direct Student Loan should be filed no later than April 1 for the following academic year. Complete information is contained in the pamphlet, "On the Trail of Student Financial Aid," available in the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Warren Stickler Memorial Loan Fund (1966)—A fund established by the Precision Measurements Association as a memorial to Warren Stickler is available to engineering students.

John Brewster Willis, Jr., Loan Fund in Mechanical Engineering—Established by Mrs. William L. Lane as a memorial to her nephew, John Brewster Willis, Jr. Available to Mechanical Engineering students (graduate or undergraduate) who are primarily interested in aeronautics.

Two short-term emergency loan funds are also available at the University. Information concerning these funds is available from the Office of Student Financial Aid.

STUDENT EMPLOYMENT

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Student and Alumni Career Services Office maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration, students may apply at the Student and Alumni Career Services Office, Woodhull House, 2033 G Street, N.W., for interviews and referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, page 202.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is at a minimum approximately $7,300. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

Prizes

Norman B. Ames Memorial Award—Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by his fellow students as having made significant contributions to the students in the School of Engineering and Applied Science, to the School, and to the University.

Deacon Ames Activities Award—A plaque awarded annually by Gamma Beta Chapter of Theta Tau Fraternity to the senior in the School of Engineering and Applied Science with the most outstanding record in activities for the entire period of attendance.

Martin Mahler Prize in Materials Testing—A one-year membership in the American Society for Testing Materials awarded to the upper division or graduate student in engineering who submits the best reports on tests in the materials laboratories course with preference given to prestressed concrete tests.

Alfred Martin Freudenthal Prize—Established as a memorial to Professor Freudenthal by his wife, friends, students, and colleagues for his outstanding contributions to engineering education. This honor for academic excellence is

awarded annually to the senior who graduates with the highest scholastic standing. The student will receive a cash award, and his/her name will be engraved on a plaque displayed in Tompkins Hall.

Regulations

A student enrolled in the School of Engineering and Applied Science is required to conform to the following regulations.

A student who withdraws or is suspended or who, for any other reason, is not registered at the University for one semester or more, may re-enter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible for subsequent registration in the University except by special action of the Faculty.

ACADEMIC DISHONESTY

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University Policy on Academic Dishonesty can be obtained from the following officers: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or require-

ments applicable only to a particular program, facility or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

CHANGES IN PROGRAM OF STUDY

A student may not make any changes in an approved program of study without the approval of the Associate Dean. Requests for changes in class registration must be made on a form provided in the School's Admission office.

During the seven days following the first day of classes of a semester, courses may be added to the student's program with the approval of the instructor, the faculty adviser, and the Associate Dean.

WITHDRAWAL

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

Applications for withdrawal from the University or for changes in class scheduling must be made in person or in writing to the individuals indicated below. Notification to an instructor is not an acceptable notice.

Regular Withdrawal—Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, and the Associate Dean.

Late Withdrawal—Withdrawal from any course without academic penalty after the 28th day following the first day of classes of a semester may be granted with the approval of the instructor, the student's adviser, the chairman of the department in which the student is enrolled, and the Associate Dean. Requests for late withdrawal must be submitted to the Associate Dean's office on the appropriate form and must be accompanied by a drop-add slip. Late withdrawals may be granted only under both of the following conditions:

1. The request is made necessary by exceptional circumstances such as certified medical absence or forced absence caused by work-related requirements
2. The grades in all courses involved are *C* or better for graduate students, and *D* or better for undergraduate students as of the date of the request.

In all cases, financial regulations governing withdrawal remain in full effect.

Change in Course Status—The status of a course may not be changed from credit to audit or vice-versa after the 28th day after classes have started for the semester.

Full tuition is charged for courses dropped without the approval of the Associate Dean. Such unauthorized withdrawal will result in the recording of a failing grade for the course or courses. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

CREDIT

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the granting of advanced standing.

Auditing—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Balance Sheet—On request the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

Post-admission Transfer Credit—A student who plans to attend another institution and apply credit so earned toward graduation from this University must first secure the written approval of the adviser, the Department Chairman, and the Associate Dean, on a form available in room 103, Tompkins Hall. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

GRADUATION REQUIREMENTS

To be recommended by the faculty for graduation, a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the summer sessions will be awarded diplomas (no formal convocation) dated September 30, provided they have completed all degree requirements and have applied for graduation as a part of registration for the summer sessions.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

Student Records—Information on the status of credit, transfer-of-credit awards, balance sheets, and other information relating to graduation may be obtained in Room 103, Tompkins Hall.

Area of Concentration Certificate—Upon successful completion of the Master's degree the student, by means of a written request to the appropriate Department Chairman, may obtain a certificate indicating the area of concentration.

THE LIBRARY

All students registered in the University have the privilege of using the University Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 14 days. Any book which circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open, except that they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. Afford students access to education records directly related to them;
2. Offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. Receive the student's written consent before releasing information from his or her education records to persons outside the University, except as provided by the Act and except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. Comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: ame, local address; telephone number; name and address of next of kin; dates f attendance; school, college, or division of enrollment; field of study; credit ours earned; degrees earned; honors received; participation in organizations nd activities chartered or otherwise established by the University (including ntercollegiate athletics); and height and weight of members of athletic teams. student who does not wish such directory information released must file ritten notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student formation may be obtained from the Office of the Registrar.

IGHT TO DISMISS STUDENTS

he right is reserved by the University to dismiss or exclude any student from e University, or from any class or classes, whenever, in the interest of the udent or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is located on campus in the Safety and Security Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violations of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

Consortium of Universities of the Washington Metropolitan Area, Inc.

The universities in Washington, D.C. (American University, Catholic University of America, George Washington University, Georgetown University, Howard University, and the University of the District of Columbia) are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to campus degree candidates. The following, however, are excluded: students in Canon Law, Dentistry, Medicine, and Theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the announcements of programs of all the participating institutions. See page 214 for more information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar and in room 103, Tompkins Hall. Students register and pay tuition at their own institutions for Consortium courses; course fees are payable to the visited institutions.

Center for Academic and Administrative Computing

The Center for Academic and Administrative Computing is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week, to all faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The Center operates an IBM 3031 (OS/VS1) central processing unit and a PDP 11 minicomputer which provides terminal and card remote-job-entry to the 3031. There is a full range of compilers and application software packages.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

The Speech and Hearing Clinic

The Speech and Hearing Clinic offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech; and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, brain damage, mental retardation, and environmental factors.

The Reading Center

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school and college students as well as other adults.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed.

Fees.—Individuals should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center, Building C, Suite 429, 2201 G Street, N.W.

Veterans Benefits

The Veterans Counselor's Office, located on the third floor of Rice Hall, 2121 Eye St., N.W., assists those students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

ROTC

George Washington University students may enroll in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Credit for such courses may be transferable to George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

Alumni Associations

THE GENERAL ALUMNI ASSOCIATION

The objectives of this Association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those who are life members of the George Washington University General Alumni Association or the Alumni Association of any school of the University, or are current contributors to the George Washington University Annual Support Program.

All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni. The Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

THE ENGINEER ALUMNI ASSOCIATION OF THE GEORGE WASHINGTON UNIVERSITY, INC.

The Association was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to the engineering alumni. The objectives of the Association are to provide the link between the graduates and faculty of the School, to help promote the general welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 elected members of the Association and the Engineers' representatives serving on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and one representative each from the faculty of the School and the student body. Members of the Association are elected each year, prior to the June meeting, to three-year board memberships as listed below:

Term Expiring 1981
John V. Howie
John A. LeReche
Eric S. Mendelsohn
Dudley J. Schwartz
James A. Sinsabaugh

Term Expiring 1982
Wesley G. Harris
Mary O. Jones
John P. Storms
Stuart F. Terrett III
James Wong

Term Expiring 1983
Robert Dickey, Jr.
Jacquelyn Eisenberg
Pastor Farinas
David W. Johnson
Harold Sangester

General Alumni Association Representatives
Douglas L. Jones
John R. Manning
Issa Khozeimeh

Student Representative
Mark Eisenberg

Faculty Representative
Galip M. Arkilic

Regional Director
William H. Holt

At the June meeting each year the board elects officers for its operation during the upcoming year. The officers for the year 1980–81 are:

President—Pastor Farinas, M.E.A. 1972; 5 Bethayres Ct., Rockville, Md. 20855

Vice President—Eric S. Mendelsohn, B.S.C.E. 1967; 7728 Warbler Lane, Derwood, Md. 20855

Secretary—Wesley G. Harris, B.S.C.E. 1962; 8732 Higdon Drive, Vienna, Va. 22180

Treasurer—Dudley J. Schwartz, M.S. 1973; 14132 Flint Rock Road, Rockville, Md. 20853

STUDENT LIFE

The office of the Vice President for Student Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Students, Student Activities, Student and Alumni Career Services, and Student Health Service.

Student Services

OFFICE OF THE DEAN OF STUDENTS

The Office of the Dean of Students provides counseling and information for students and assists in program development for the Division of Student Affairs. Staff members are well-informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The Dean of Students is responsible for the services and programs offered by the Counseling Center, the Educational Opportunity Program, International Student Advising Office, Services for Students with Disabilities, the Student Health Service; and the Student and Alumni Career Services Office.

SERVICES FOR STUDENTS WITH DISABILITIES

The Director of Services for Students with Disabilities works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extra-curricular life of the campus are provided for them through university or community resources.

HOUSING

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University also may be obtained at this Office.

Admission to the University does not include a room reservation. The student will receive, with his notification of acceptance, University residence hall information, an application for residence hall space or apartment accommodation, and a declaration of intent to attend the University. The application for residence hall space or apartment accommodation must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge or held as a security deposit on an apartment. Rooms and apartments are leased for the academic year, and lease payment must be made in early June for the fall semester.

1981–82 Residence Hall Rates Per Person for Two Semesters*

For Men:

Calhoun Hall	
double room	$1,520
triple room	1,470

For Women:

Strong Hall	
single room	1,650
double room	1,520
triple room	1,470

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—	
double room	1,520
Everglades Hall (limited to juniors and seniors)—	
apartment for two persons	1,780 or 1,690
apartment for three persons	1,580
Building JJ (limited to sophomores, juniors, and seniors)—	
apartment for 4 or 6 persons	1,580
Francis Scott Key Hall (limited to juniors and seniors)—	
apartment for two persons	1,690
apartment for three persons	1,690 or 1,580
Madison Hall	
double room	1,520
triple room	1,470
Milton Hall (limited to juniors and seniors)—	
apartment for two persons	1,780 or 1,690
apartment for three persons	1,580
Mitchell Hall (limited to sophomores, juniors, and seniors)—	
single room	1,650
Munson Hall (limited to juniors and seniors)—	
apartment for two persons	1,780 or 1,690
apartment for three persons	1,580
Thurston Hall	
double room, triple room, room for four	1,520
suite for six	1,420

* Residence Hall prices and allocation subject to change.

Guthridge Apartments

This apartment house is a University owned, commercially operated building within the campus area. It contains efficiency and one-bedroom units, which are rented only to full-time graduate students on an "as available" basis. Referrals to the resident manager of this building are made by the Director of Housing when notice is received of vacancies. Leases are executed with the management company and are on a month-to-month basis.

FOOD SERVICE

Resident freshmen and sophomores are required to choose one of the following three food service plans. The seven-day, 19 meals per week plan, at the rate of $1,360* for the academic year; the any 14 meals per week plan at $1,310* for the academic year; or the any 10 meals per week plan at $1,250* for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

EDUCATIONAL OPPORTUNITY PROGRAM

The Educational Opportunity Program is designed to provide selected District of Columbia high school graduates and other qualified District residents with financial and personal support as well as academic assistance to help students pursue undergraduate degree work at George Washington University. The Program office is located at 2127 G Street, N.W.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; by the departments of drama, dance, and music; and by other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the Center by working closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located in the H. B. Burns Memorial Building at 935 22nd St., N.W.

*Food service prices subject to change.

The Health Service is staffed by physicians, nurse practitioners, and physician's assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in the College of General Studies and Continuing Engineering Education Program are not eligible. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The University has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should consult the Student Health Service or the Office of the Dean of Students.

COUNSELING CENTER

The Counseling Center, located at 718 21st St., N.W., works to enable students to overcome obstacles which hamper learning. The Center's services are offered to students and staff, and include resolution of the individual's educational, vocational, or personal conflicts through short-term individual or group counseling, vocational testing, or study skills training; training of graduate students, resident assistants, and paraprofessionals; consulting on mental health topics; and development of new methods and programs to aid student growth, such as counseling through written communication, videotaped counselor skills training, and interpersonal skills workshops.

The Center administers the Miller Analogies Test, admissions testing, and special assessments for business and industry. Through its Office of Community Services, the Counseling Center also provides vocational counseling and educational programs to the greater Washington community.

Students may request a cost-free interview from 9 a.m. to 4:30 p.m., Monday through Thursday, and 1 to 4:30 p.m. on Fridays. If the student decides to continue, a modest fee per appointment will be charged for short-term treatment. If a test battery is called for, an additional $16 materials fee will be charged. However, if financial need is a factor, fee adjustments can be made.

INTERNATIONAL SERVICES OFFICE

Located in the International House at 2129 G St., N.W., the staff of the International Services Office provides advising and counseling in matters of personal and academic concern and visa regulations. This office is also a consultation, information, and resource center for the University's international population.

STUDENT AND ALUMNI CAREER SERVICES OFFICE

The Career Services Office provides career guidance and placement assistance to University students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a resource center of literature on occupations and employers, and current information on government employment including testing dates and application forms. Seniors and alumni may also use the Office to establish credential files for application to graduate schools and for employment. The Office is located at Woodhull House, 2033 G St., N.W.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.

DAVIS-HODGKINS HOUSE

The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The House, at 2142 G Street, N.W., provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

tudent Activities

he offices of the Vice President for Student and Alumni Affairs, the Dean of udents, the Director of the Cloyd Heck Marvin Center, and the Director of udent Activities are responsible for all co-curricular phases of student life.

TUDENT ACTIVITIES OFFICE

e Student Activities Office assists individual students and organizations in pro- am development, campus leadership training, and participation in special proj- s, both within the University community and the community at large. The fice serves as a clearinghouse for activities information, registers and advises dent organizations, and informs the University community of activities and grams through monthly and annual publications. The Student Activities fice is also responsible for coordinating the orientation program for new dents, and for planning supplemental development programs for graduate

and undergraduate students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

Additional information about the numerous student organizations and committees is contained in the *Student Handbook,* compiled by and available at the Student Activities Office in the Marvin Center.

STUDENT GOVERNMENT

The George Washington University Student Association is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. The Student Association provides various services for students such as an academic evaluation, a student directory, and the Student Advocate Service. Further information can be obtained from the Student Association offices in the Marvin Center.

Student involvement in the governance of the University is also possible through participation in various administrative and Faculty Senate committees, advisory councils of the schools and colleges, selected committees of the Board of Trustees, and specialized bodies such as the Residence Hall Association, the Joint Food Services Board, and the Marvin Center Governing Board. This involvement has helped develop policies and programs beneficial to students and to the total University community.

THE ENGINEERS' COUNCIL

The Engineers' Council is the student governing body for the School of Engineering and Applied Science, composed of elected representatives from each level class and from the graduate student body, from each student organization in the School, and the House Manager of the Davis-Hodgkins House. The purpose of the Council is to provide liaison between the student body of the School and the Faculty, Administration, and Student Government of the University in all matters affecting the general interests and welfare of the student body, the School, or the University. The Council is maintained financially by the Engineers' Council fee paid by each student in the School, and sponsors the Engineers' Mixers and the Engineers' Ball. Council meetings are open to all students in the School.

STUDENT ORGANIZATIONS

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 160 organizations on campus concerning a broad spectrum of interests including: academic, professional, honorary, international, cultural, political interest, service, special interest, sports, hobbies and recreation, religious and meditative, as well as social fraternities and sororities. More complete information about these organizations can be obtained through the Student Activities Office.

The following is a representative list of organizations active at the University that are of particular interest to students in the School of Engineering and Applied Science.

Honor Societies

Sigma Xi—A national scientific honor society, the purpose of which is to encourage original investigation in pure and applied science. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

Delta Sigma Rho-Tau Kappa Alpha—A national forensic society.

Mortar Board—A national society for juniors and seniors, stressing leadership, scholarship, and service.

Omicron Delta Kappa—A national society emphasizing leadership in extracurricular activities.

Phi Eta Sigma—A national society established to encourage and reward high scholarship and attainment, membership in which is limited to those freshmen who attain a scholastic average of at least 3.50 or the equivalent.

Tau Beta Pi—A national engineering honorary fraternity, the purpose of which is to recognize distinguished scholarship and exemplary character.

Eta Kappa Nu (Theta Iota Chapter)—A national electrical engineering honor society established to recognize scholarship, character, and service.

Omega Rho—A national operations research honor society established to recognize outstanding scholarship, character, and service.

International and Cultural Exchange Organizations

East Asian Society, Friends of Canada, International Students' Society, Latin American Association, Libyan Student Organization, Organization of Arab Students, Polish American Youth Club, Students' Cultural Association of India, World Affairs Society.

Performing Arts

GWU Dance Production Groups; Student Productions; University Chamber Choir, Chorus, Orchestra; University Program Board; University Theater. A variety of programs is presented by these groups throughout the academic year.

Political Interest Organizations

GW Ripon Society, GW College Young Republicans, GW Young Democrats, Young Americans for Freedom, Young Socialist Alliance.

Professional Organizations

American Society of Civil Engineers (Student Chapter).

American Society of Mechanical Engineers (Student Chapter).

Institute of Electrical and Electronic Engineers (Student Chapter).

Theta Tau (Gamma Beta Chapter).—A national professional (engineering) fraternity. Membership by invitation to outstanding students who have completed successfully at least the first year in the School of Engineering and Applied Science.

Publications and Communications

The Cherry Tree (yearbook), *G.W. Forum* (student-faculty journal), *Potomac Review* (publication of Consortium graduate students), *The Rock Creek* (liter-

ary magazine), *Student Handbook, This Month* (listing of major cultural events in the Washington area), *Campus Calendar* (biweekly listing of scheduled events), *The University Hatchet* (semi-weekly newspaper), WRGW (University radio station), 676-NEWS (recorded telephone message of daily University activities).

Religious and Meditative Organizations

Baptist Student Union, B'nai B'rith Hillel Foundation, Christian Science Organization, Eastern Orthodox Fellowship, Eckankar Campus Society, Inter-Varsity Christian Fellowship, Lutheran Student Association, Newman Foundation, Psychegenics Club, Religious Society of Friends, Student International Meditation Society, Unitarian-Universalist Club, United Christian Fellowship, Wesley Foundation.

Service Organizations

Circle K, Ecology Action, GW Medical Aid, Project Share, St. Elizabeth's Hospital Project, SERVE, Student Housing Project, Student Volunteer Action Council.

Social Fraternities

Delta Tau Delta, Kappa Sigma, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Tau Kappa Epsilon. The Interfraternity Forum coordinates the interest and concerns of some of the fraternities on campus.

Social Sororities

Delta Gamma, Delta Sigma Theta, Kappa Kappa Gamma, Phi Sigma Sigma. A Panhellenic Council includes representatives of sorority chapters at the University.

Special Interest and Advocate Groups

Black Peoples' Union, Jewish Activist Front, Legal Aid Bureau, Peoples' Union, D.C. Public Interest Research Group (GW Chapter), Student Recruitment Committee.

Sports, Hobbies, Recreational Organizations

Amateur Radio Club, Cheerleaders, Collegiate Bowling Club, Folkdance Club, Hockey Club, Military Collectors, Philubious Eggworte (music).

ATHLETICS, INTRAMURAL SPORTS, AND RECREATION

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball, and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight rooms; handball and squash courts; and a sauna and lockers. Based in the Smith Center, the men's and women's athletic departments offer a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association for Intercollegiate Athletics for Women, and the Eastern Association of Intercollegiate Athletics for Women. Its Varsity teams compete against major universities throughout the Midwest and Eastern Seaboard in such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

MAJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and in the art gallery of the Cloyd Heck Marvin Center. With the cooperation of the Curator of Art, an annual student art exhibit is presented.

Concert Series—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

International Programs—The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

Orchestra and Chorus Concert Series—The University Orchestra and Chorus are two facets of the lively arts available to students either as credit courses or as extracurricular activities. The Chorus presents major performances to the University community three or four times a year, including regular winter and spring concerts. The University Orchestra presents several performances annually.

Program Board—The University Program Board, composed chiefly of elected and appointed students, is given primary responsibility and resources for student programming on campus. Through its various committees, and in cooperation with other campus groups, it regularly sponsors films, lectures, concerts, social activities, and special events.

Theater—The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre or in Lisner Auditorium. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students have the opportunity to participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.

THE UNIVERSITY

History and Organization

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is large but intangible.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School

was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area is not without its reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street; the first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington had selected Twenty-third and E Streets as the site of the National University he hoped to see established.

The University as it is now organized consists of Columbia College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; the College of General Studies; the Division of University and Summer Students; and the Division of Experimental Programs.

The George Washington University is privately endowed. It is governed by a Board of Trustees of which the University president is an *ex officio* member.

The University Libraries

The library collections of the University are housed in the Melvin Gelman Library (the general library of the University) and in the libraries of the Institute for Sino-Soviet Studies, the National Law Center, and the School of Medicine and Health Sciences.

These collections contain approximately 1,126,000 volumes, to which are added some 40,000 volumes a year. Endowments supplementing the University appropriation provide books in the fields of American civilization, American literature, foreign service, history, public finance, and the social sciences; and gifts from many sources have enriched the collections. The libraries currently receive about 11,900 serials.

Information concerning the use of the libraries may be obtained at the library service desks.

The library is administered for the curricular, reference, and recreational needs and interests of the students. Instruction in the use of the library is given upon request by the reference librarians. The library endeavors to assist students and all members of the University to use the rich library resources of Washington and the unusual opportunities they offer for extensive research. Interlibrary loan arrangements are maintained with other libraries in the city and throughout the United States.

The student has access to the Library of Congress, the Public Library of the District of Columbia and its branches, and many of the special collections of the government departments. Graduate students at George Washington University may, upon application, be issued a Consortium library card which permits direct borrowing from the libraries of the other Consortium Institutions.

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Joseph Young Ruth, B.A., *Director of Admissions*

SCHOOL OF ENGINEERING AND APPLIED SCIENCE
FACULTY AND STAFF OF INSTRUCTION*

EMERITUS

Benjamin Carpenter Cruickshanks, *Professor Emeritus of Mechanical Engineering*
B.S. in M.E. 1920, George Washington University

Joseph Foa, *Professor Emeritus of Engineering and Applied Science*
Dr.Ing. (M.E.) 1931, Polytechnic Institute of Torino, Italy; Dr.Ing. (A.E.) 1933, University of Rome

Kenneth Johnson, *Professor Emeritus of Engineering Administration*
B.A. 1931, Indiana State University; Ph.D. 1937, Purdue University

Herbert Ernest Smith, *Professor Emeritus of Engineering Administration*
B.S. 1930, C.E. 1932, City University of New York, City College; M.S. 1936, Ph.D. 1940, New York University

Carl Hugo Walther, *Professor Emeritus of Engineering and Applied Science*
B.E. 1931, M.C.E. 1933, Johns Hopkins University; Ph.D. 1967, University of Maryland

ACTIVE

Abd-elfattah Abdalla, *Professor of Engineering and Applied Science*
B.S. 1960, Ain Shams University, Egypt; M.S. 1963, Alexandria University, Egypt; Ph.D. 1969, University of Maryland

Harvey I. Abelson, *Associate Professorial Lecturer in Engineering*
B.M.E. 1963, The Cooper Union; M.S. 1965, Stevens Institute of Technology; Ph.D. 1969, University of Maryland

Achilles Grammenos Adamantiades, *Professorial Lecturer in Engineering*
Ph.D. 1966, Massachusetts Institute of Technology

Julian Gordon Adler, *Associate Professorial Lecturer in Engineering*
B.S.E. 1960, University of Michigan

Joseph Morris Aein, *Professorial Lecturer in Engineering*
B.S. in E.E. 1958, Massachusetts Institute of Technology; M.S. in E.E. 1958, Ph.D. 1962, Purdue University

* Professors, Adjunct Professors, Associate Professors, Assistant Professors, and Instructors constitute the Faculty. The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty.

Charles Alexander, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1962, Lowell Technological Institute; M.S. 1965, University of New Hampshire; Ph.D. 1973, University of Maryland

Charles Anello, *Professorial Lecturer in Engineering*
B.S. 1958, Towson State University; Sc.M. 1962, Sc.D. 1964, Johns Hopkins University

Richard D. Angelari, *Assistant Professorial Lecturer in Engineering*
B.E.E. 1956, M.E.E. 1963, Polytechnic Institute of New York; Ph.D. 1975, New York University

Maurice Apstein, *Research Professor of Engineering Administration*
B.S. in E.E. 1932, City University of New York, City College; M.E.A. 1960, George Washington University; Ph.D. 1963, American University

Galip Mehmet Arkilic, *Professor of Applied Science*
B.S. in M.E. 1946, Cornell University; M.S. 1947, Illinois Institute of Technology; Ph.D. 1954, Northwestern University

Clifford J. Astill, *Professorial Lecturer in Engineering*
B.E. 1958, University of Queensland; M.S. 1968, D.Sc. 1971, Columbia University

Robert Fulton Baker, *Professorial Lecturer in Engineering*
B.C.E. 1940, Ohio State University; M.S. in C.E. 1942, Purdue University

Gordon Banerian, *Professorial Lecturer in Engineering*
B.S.(M.E.) 1943, Lawrence Institute of Technology; M.S. 1950, Wayne State University; Ph.D. 1969, University of California

Richard Walker Barnwell, *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Auburn University; Ph.D. 1968, Virginia Polytechnic Institute and State University

Zeev Barzily, *Assistant Professor of Operations Research*
B.S. 1968, M.S. 1971, D.Sc. 1974, Technion, Israel Institute of Technology

Nicholas L. Basdekas, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, C.E. 1958, Columbia University; Ph.D. 1969, Catholic University of America

Harry Lee Beach, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1966, M.S. 1968, Ph.D. 1970, North Carolina State University at Raleigh

John Amos Belding, Jr., *Professorial Lecturer in Engineering*
B.S. 1965, Ph.D. 1969, University of Alabama

Bruce A. Bell *Associate Professor of Engineering*
B.C.E. 1968, M.S.C.E. 1969, Ph.D. 1974, New York University

John William Benoit, *Associate Professorial Lecturer in Engineering*
B.S. 1952, University of Washington; M.S. 1954, North Carolina State University at Raleigh; Ph.D. 1961, Princeton University

Peter D. Bergstrom, *Associate Professorial Lecturer in Engineering*
B.E.E. 1960, M.S.E.E. 1963, Ph.D.E.E. 1973, Georgia Institute of Technology

Simon Berkovich, *Associate Professor of Engineering and Applied Science*
M.S. 1960, Moscow Physical-Technical Institute; Ph.D. 1964, Institute of Precise Mechanics and Computer Technology, U.S.S.R.

John Albert Berning, Jr., *Assistant Professorial Lecturer in Engineering*
B.A. 1972, Colgate University; M.A. 1974, Ph.D. 1978, Duke University

Alan McCauley Biddison, *Assistant Professorial Lecturer in Engineering*
B.S. in Eng. 1962, United States Military Academy; M.B.A. 1972, Rochester Institute of Technology; J.D. 1977, George Washington University

William Thomas Bisignani, *Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Ph.D. 1972, Rutgers—The State University

Lewis Horrigan Blakey, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1954, University of Notre Dame; M.S. 1962, George Washington University; Ph.D. 1971, Catholic University of America; M.B.A. 1974, University of Chicago

Richard R. Blanchard, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1964, M.S. in E.E. 1966, University of Vermont; M.E.A. 1972, George Washington University

Jerry Wayne Blankenship, *Associate Professorial Lecturer in Engineering*
M.S. 1970, Western Kentucky University; Ph.D. 1974, Northwestern University

Peter Bock, *Associate Professor of Engineering*
B.A. 1962, Ripon College; M.S. 1964, Purdue University

William James Boettinger, *Assistant Professorial Lecturer in Engineering*
B.E.S. 1968, Ph.D. 1972, Johns Hopkins University

Pock Boon, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1967, University of North Dakota; M.S.(E.E.) 1972, Louisiana State University

Thomas M. Bottegal, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1972, George Washington University

Roland Lee Bowles, *Assistant Professorial Lecturer in Engineering*
B.S. 1959, Randolph-Macon College; M.S. 1961, Ph.D. 1971, University of Virginia

Edward Howard Braun, *Associate Professor of Engineering and Applied Science*
A.B. 1948, M.A. 1950, Columbia University

Fred Michael Brosi, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1970, Carnegie-Mellon University; M.S. 1975, George Washington University

Ronald Max Brown, *Associate Professorial Lecturer in Engineering*
B.S. 1958, M.S. 1960, M.A. 1964, Ph.D. 1970, Indiana University at Bloomington

Stanley Buckser, *Professorial Lecturer in Engineering*
B.S. 1951, Long Island University; M.S. 1974, Vanderbilt University; Ph.D. 1957, University of Massachusetts

Ali Bulent Cambel, *Professor of Engineering and Applied Science*
B.S. 1942, Robert College, Turkey; M.S. 1946, California Institute of Technology; Ph.D. 1950, University of Iowa

John Paul Campbell, *Research Professor of Engineering*
B.S. 1939, Auburn University

Robert L. Carroll, Jr., *Associate Professor of Engineering and Applied Science*
B.S. 1967, North Carolina State University at Raleigh; M.Phil. 1970, Yale University; Ph.D. 1973, University of Connecticut

John H. Carson, *Associate Professorial Lecturer in Engineering*
B.S. 1969, M.S. 1970, Ph.D. 1976, Lehigh University

Herbert Carus, *Associate Professorial Lecturer in Engineering*
B.S. 1943, City University of New York, City College; M.S. 1964, New York University

Shih-Chun Chang, *Assistant Professor of Engineering and Applied Science*
B.S.(E.E.) 1970, National Cheng Kung University; Ph.D. 1977, University of Hawaii

Yun Chang, *Assistant Professorial Lecturer in Engineering*
B.S.(E.E.) 1947, National Tung-Chi University, China; M.S.(E.E.) 1952, Polytechnic Institute of New York

Chin-Kuei Cho, *Associate Professorial Lecturer in Engineering*
B.S. 1962, National Cheng Kung University, Taiwan; M.S. 1968, University of Houston; Ph.D. 1971, University of Texas

Malcolm P. Clark, *Assistant Professorial Lecturer in Engineering*
B.S. in Ed. 1963, Murray State University; M.S. 1968, George Washington University

Paul LeRoy Coe, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1966, Hofstra University; M.S. 1967, Ph.D. 1972, New York University

James Thomas Coleman, *Professorial Lecturer in Engineering*
B.S. 1949, B.S. 1951, John Brown University; M.S. in E.E. 1954, University of Arkansas; Ph.D. 1967, Temple University

Terry Leo Collins, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1967, Massachusetts Institute of Technology; M.S. in E.E. 1969, University of Wisconsin; D.Sc. 1976, George Washington University

Paul Arthur Crafton, *Professor of Engineering Administration*
B.M.E. 1944, City University of New York, City College; M.S. 1950, Ph.D. 1956, University of Maryland

Paul James Crepeau, *Professorial Lecturer in Engineering*
B.S. 1957, University of Rhode Island; M.S. 1960, Ph.D 1967, Polytechnic Institute of New York

Milton Orlo Critchfield, *Associate Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1965, Pennsylvania State University; Ph.D. 1971, University of Illinois

Michael Charles Cullingford, *Associate Professorial Lecturer in Engineering*
B.Sc. 1961, University of Durham, England; M.Sc. 1966, King's College, England; Ph.D. 1975, North Carolina State University

Allen Das, *Associate Professorial Lecturer in Engineering*
B.S. 1945, M.S. 1947, Calcutta University; Ph.D. 1962, University of London

Robert Dillon, *Professorial Lecturer in Engineering*
B.A. 1949, University of Washington; M.A. in Arch. 1952, University of Florida

Louis Divone, *Professorial Lecturer in Engineering*
B.Ae.E. 1955, Polytechnic Institute of New York; M.S. 1956, Massachusetts Institute of Technology

Norman Abbott Dresner, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, Rensselaer Polytechnic Institute; M.A. 1965, Yeshiva University

John Edward Duberg, *Research Professor of Engineering Administration*
B.S. 1938, Manhattan College; M.S. 1940, Virginia Polytechnic Institute and State University; Ph.D. 1948, University of Illinois

Charles Earl Dunham, *Associate Professorial Lecturer in Engineering*
B.S. 1963, Rochester Institute of Technology; M.S. in E.E. 1966, Ph.D. 1972, Syracuse University

Jules Berthold Du Peza, *Professorial Lecturer in Engineering*
B.S. 1949, U.S. Coast Guard Academy; M.S. 1964, U.S. Naval Postgraduate School

Douglas Leon Dwoyer, *Assistant Professorial Lecturer in Engineering*
B.S. 1964, M.S. 1967, Ph.D. 1975, Virginia Polytechnic Institute and State University

Donald Ray Edmonds, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1960, B.A. 1960, Rutgers—The State University; M.S. 1966, Ph.D. 1973, Ohio State University

John Eftis, *Professor of Engineering and Applied Science and Adjunct Professor of Mathematics*
B.C.E. 1952, City University of New York, City College; M.S. in C.E. 1958, Columbia University; D.Sc. 1967, George Washington University

Marvin F. Eisenberg, *Professor of Engineering and Applied Science*
B.S. in E.E. 1953, University of Miami; M.S. in Engr. 1954, Ph.D. 1961, University of Florida

Donald Ellison, *Associate Professorial Lecturer in Engineering*
B.S. 1948, Tri-State College; M.P.A. 1951, Cornell University

Diana Marie Engel, *Assistant Professorial Lecturer in Engineering*
B.A. 1965, Goucher College; M.S. 1979, George Washington University

Wayne Douglas Erickson, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Michigan State University; M.S. 1958, D.Sc. 1962, Massachusetts Institute of Technology

Donald Michael Esterling, *Professor of Engineering*
B.S. 1964, University of Notre Dame; M.A. 1966, Ph.D. 1968, Brandeis University

Joel Ettinger, *Associate Professorial Lecturer in Engineering*
B.C.E. 1967, City University of New York, City College; M.S. 1969, Northwestern University

Robert Henry Evans, *Assistant Professorial Lecturer in Engineering*
B.S. 1970, M.S. 1971, Duke University; D.Sc. 1975, George Washington University

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sabbatical leave 1981 fall semester.

sabbatical leave 1982 spring semester.

James Edward Falk, *Professor of Operations Research*
B.E.E. 1960, University of Detroit; M.S. 1961, Ph.D. 1965, University of Michigan

Fereidoun Farassat, *Associate Professorial Lecturer in Engineering*
B.E. 1967, American University of Beirut; M.S. 1970, Cornell University; Ph.D. 1973, Cornell University

James Elmer Feir, *Professor of Civil Engineering; Associate Dean of the School of Engineering and Applied Science*
B.S. 1950, University of Alberta; M.S. 1955, University of London; Ph.D. 1966, Cambridge University

David Feit, *Associate Professorial Lecturer in Engineering*
A.B. 1958, B.S. 1959, M.S. 1961, Eng.Sc.D. 1964, Columbia University

Michael Bliss Feldman, *Associate Professor of Engineering and Applied Science*
B.S.E. 1966, Princeton University; M.S.E. 1970, Ph.D. 1973, University of Pennsylvania

Anthony Vincent Fiacco, *Professor of Operations Research and Applied Science*
B.A. 1950, Union College, New York; Ph.D. 1967, Northwestern University

Francis Edward Field, *Assistant Professorial Lecturer in Engineering*
B.S. 1945, U.S. Naval Academy; M.A. 1965, George Washington University; A.M.P. 1970, Harvard University

*James David Foley, *Professor of Engineering and Applied Science*
B.S. 1964, Lehigh University; M.S. 1965, Ph.D. 1969, University of Michigan

Charles William Fotis, *Professorial Lecturer in Engineering*
A.B. 1937, M.A. 1939, Tufts University; Ph.D. 1959, American University

Paul Jeffery Fox, *Assistant Professorial Lecturer in Engineering*
B.S. 1969, Yale University; M.S. 1973, Massachusetts Institute of Technology

Raymond Richard Fox, *Professor of Engineering and Applied Science*
B.S. in C.E. 1949, M.S. in C.E. 1952, University of Washington

Robert William Fralich, *Associate Professorial Lecturer in Engineering*
B.Ae.E. 1947, University of Cincinnati; M.Ae.E. 1952, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Gabriel Frenkel, *Professorial Lecturer in Engineering*
B.S. 1956, The Cooper Union; M.S. 1960, City University of New York, City College; Ph.D. 1972, George Washington University

Arthur D. Friedman, *Professor of Engineering and Applied Science*
B.A. 1961, B.S. in E.E. 1962, M.S. in E.E. 1963, Ph.D. 1965, Columbia University

Fred Frishman, *Adjunct Professor of Operations Research and Applied Science*
B.B.A. 1947, City University of New York, City College; A.B. 1956, M.A. 1957, Ph.D. 1971, George Washington University

Martin Fritts, *Assistant Professorial Lecturer in Engineering*
B.S. 1965, Holy Cross College; M.S. 1966, M.Phil. 1968, Ph.D. 1972, Yale University

Yuen-sun Fu, *Assistant Professorial Lecturer in Engineering*
B.S. 1955, Taipei Institute of Technology; M.S. 1959, Kansas State University; Ph.D. 1975, University of Kansas

Robert Earle Fulton, *Professorial Lecturer in Engineering*
B.S. 1953, Auburn University; M.S. 1958, Ph.D. 1960, University of Illinois

Michael John Furman, *Assistant Professorial Lecturer in Engineering*
B.S.M.E. 1970, New York College of Engineering; M.S.M.E. 1972, University of California

Charles Alexander Garris, *Associate Professor of Engineering*
B.E. 1965, State University of New York, Maritime College; M.S. 1968, Ph.D. 1971, State University of New York at Stony Brook

Michael Paul Gaus, *Adjunct Professor of Engineering*
B.S. 1954, M.S. 1956, Ph.D. 1959, University of Illinois

Amritpal Singh Gill, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1963, Howard University; M.S. 1965, George Washington University

*On sabbatical leave 1982 spring semester.

Charles Matthew Gilmore, *Profesor of Engineering and Applied Science*
B.S. 1963, M.S. 1964, Pennsylvania State University; Ph.D. 1971, University of Maryland

Michael Stanley Gluck, *Assistant Professorial Lecturer in Engineering*
B.S. 1961, City University of New York, City College; M.S. 1963, New York University; D.Sc. 1978, George Washington University

Ernest B. Glynn, *Associate Professorial Lecturer in Engineering*
B.S. 1956, University of Maryland

Walter Anthony Goetz, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1960, Michigan State University; M.E.A. 1974, George Washington University

Ambrose Goicoechea, *Associate Research Professor of Engineering*
B.S. 1966, California State Polytechnic University, Pomona; M.S. 1970, California State University, Los Angeles; Ph.D. 1977, University of Arizona

Herbert Goldsmith, *Professorial Lecturer in Engineering*
B.Ch.E. 1940, City University of New York, City College; M.S. 1949, Ph.D. 1953, George Washington University

Yoram Gordon, *Adjunct Professor of Engineering*
B.S. 1953, University of California, Berkeley; M.S. 1968, Ph.D. 1970, University of Arizona

*Robert Goulard, *Professor of Engineering and Applied Science*
Ph.D. 1957, Purdue University

Truman Lewis Griswold, *Assistant Professorial Lecturer in Engineering*
B.S.Aero.E. 1949, University of Cincinnati; M.E.A. 1964, George Washington University

Donald Gross, *Professor of Operations Research*
B.S. 1956, Carnegie-Mellon University; M.S. 1959, Ph.D. 1962, Cornell University

Donald Urban Gubser, *Associate Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1964, Ph.D. 1969, University of Illinois

Richard N. Gurley, *Assistant Professorial Lecturer in Engineering*
B.Ch.E. 1958, M.S. (Ch.E.) 1959, North Carolina State University; M.E. 1964, Ph.D. 1967, University of Florida

Mohamed M. Hafez, *Associate Research Professor of Engineering and Applied Science*
B.S. 1967, Cairo University, Egypt; M.S. 1970, Engr. 1971, Ph.D. 1972, M.S. 1973, University of Southern California

John Frederick Halldane, *Professorial Lecturer in Engineering*
B.S. 1959, B.Arch. 1961, University of New Zealand; Ph.D. 1968, University of Auckland, New Zealand

Michael Joseph Hanley, *Assistant Professorial Lecturer in Engineering*
B.S. 1958, U.S. Naval Academy; M.S. 1971, U.S. Naval Postgraduate School

Barry Wellesley Hannah, *Adjunct Associate Professor of Engineering*
B.S. 1963, M.S. 1965, Ph.D. 1973, University of Cincinnati

Jay Charles Hardin, *Associate Professorial Lecturer in Engineering*
B.S. 1964, M.A. 1965, Ph.D. 1969, Purdue University

Robert Joseph Harrington, *Associate Professor of Engineering*
B.S. 1962, Ph.D. 1965, University of Liverpool, England

Wesley L. Harris, *Professorial Lecturer in Engineering*
B. Aero. Engr. 1964, University of Virginia; M.A. 1966, Ph.D. 1968, Princeton University

Patrick Louis Hayes, *Professorial Lecturer in Engineering and Associate Professorial Lecturer in Mathematics*
B.S. 1970, M.S. 1971, D.A. 1973, Carnegie-Mellon University

Donald P. Hearth, *Professorial Lecturer in Engineering*
B.S. 1951, Northeastern University

Hermann Josef Helgert, *Professor of Engineering and Applied Science*
B.S. 1962, M.S. 1964, Ph.D. 1966, State University of New York at Buffalo

*On sabbatical leave 1981 fall semester.

Robert Bernard Heller, *Professor of Engineering and Applied Science*
B.S. 1946, M.S. 1948, Ph.D. 1951, St. Louis University

Robert A. Hemmes, *Professorial Lecturer in Engineering*
B.S. 1947, U.S. Naval Academy; M.S. 1956, Massachusetts Institute of Technology; Ph.D. 1969, Stanford University

Thomas Pendleton Henry, *Assistant Professorial Lecturer in Engineering*
B.E.E. 1957, Georgia Institute of Technology; M.S. 1979, George Washington University

Lloyd George Herman, *Professorial Lecturer in Engineering*
B.S.A. 1934, Ontario Agricultural College; Ph.D. 1948, McGill University

George E. Hicho, *Assistant Professorial Lecturer in Engineering*
B.S. 1960, University of Pittsburgh; M.S. 1977, George Washington University

Karla R. Hoffman, *Assistant Professorial Lecturer in Engineering*
B.A. 1969, Rutgers—The State University; M.B.A. 1971, D.Sc. 1975, George Washington University

Lance J. Hoffman, *Associate Professor of Engineering and Applied Science*
B.S. 1964, Carnegie-Mellon University; M.S. 1967, Ph.D. 1970, Stanford University

Douglas LeRoy Hogan, *Professorial Lecturer in Engineering*
B.S. 1950, George Washington University; M.S. 1954, E.E. 1961, Massachusetts Institute of Technology

Richard Frank Hoglund, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Ph.D. 1960, Northwestern University

Gerald M. Hollander, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1949, University of South Carolina; M.A. 1965, George Washington University; Ph.D. 1974, Walden University

Joel Lawrence Horowitz, *Professorial Lecturer in Engineering*
B.S. 1962, Stanford University; Ph.D. 1967, Cornell University

Alexander Hoshovsky, *Professorial Lecturer in Engineering*
B.A. 1952, Saint Mary's University of Texas; M.A. 1963, George Washington University; Ph.D. 1973, American University

Wen H. Huang, *Professorial Lecturer in Engineering*
B.S.(C.E.), National Taiwan University; M.S.(C.E.), Ph.D., University of Illinois, Urbana

Hing-Loi A. Hung, *Professorial Lecturer in Engineering*
B.S. 1968, Massachusetts Institute of Technology; M.S. 1970, Ph.D. 1974, Cornell University

Timothy Ray Husson, *Assistant Professorial Lecturer in Engineering*
B.E.(E.E.) 1976, Manhattan College

Seong T. Hwang, *Associate Professorial Lecturer in Engineering*
B.S.(Ch.E.) 1961, M.S.(Ch.E.) 1963, Ph.D.(Ch.E.) 1966, University of Michigan

John Frederic Ince, *Associate Professorial Lecturer in Engineering*
B.S. 1966, Webb Institute of Naval Architecture; M.S. 1968, Massachusetts Institute of Technology; M.S. 1972, D.Sc. 1978, George Washington University

Edward Weber Ivy, *Associate Professorial Lecturer in Engineering*
B.S. 1949, U.S. Military Academy; M.S. 1960, Ph.D. 1965, Texas A&M University

Casimir Joseph Jachimowski, *Associate Professorial Lecturer in Engineering*
B.S. 1960, DePaul University; Ph.D. 1964, Michigan State University

William D. Jackson, *Professorial Lecturer in Engineering*
B.Sc. 1947, Ph.D. 1960, Glasgow University, Scotland; A.R.C.S.T. 1948, University of Strathclyde, England

Douglas Linwood Jones, *Associate Professor of Engineering*
B.M.E. 1963, M.S.E. 1965, D.Sc. 1970, George Washington University

Kay Howard Jones, *Professorial Lecturer in Engineering*
B.S. 1956, University of Washington; M.S. 1961, Ph.D. 1968, University of California, Berkeley

Henry David Kahn, *Assistant Professorial Lecturer in Engineering*
B.E.S. 1967, Johns Hopkins University; M.S. 1969, University of Miami; D.Sc. 1977, George Washington University

Walter Kurt Kahn, *Professor of Engineering and Applied Science*
B.E.E. 1951, The Cooper Union; M.E.E. 1954, D.E.E. 1960, Polytechnic Institute of New York

Stephen H. Kaisler, *Assistant Professorial Lecturer in Engineering*
B.S. 1972, M.S. 1975, University of Maryland

Sherman Karp, *Professorial Lecturer in Engineering*
B.S.(E.E.) 1960, M.S.(E.E.) 1962, Massachusetts Institute of Technology; Ph.D. 1967, University of Southern California

Roger Emanuel Kaufman, *Professor of Engineering*
B.S. 1962, Tufts University; M.F.A. 1965, Yale University; M.E. 1968, Ph.D. 1969, Rensselaer Polytechnic Institute

John Kaye, *Professor of Engineering and Applied Science*
B.S. in M.E. 1939, M.S. in M.E. 1948, California Institute of Technology

Azer Kehnemui, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Robert College, Turkey; M.S. 1963, University of Illinois; D.Sc. 1975, George Washington University

Peter M. Kelly, *Research Professor of Engineering; Director, Center for Telecommunication Studies*
B.S. 1950, Union College (New York); M.S. 1952, Ph.D. 1960, California Institute of Technology

William John Kenis, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1955, Widener College; M.S. in C.E. 1957, University of Connecticut

Khalilollah Khozeimeh, *Assistant Research Professor of Engineering and Applied Science*
B.C.E. 1965, M.S.F. 1967, D.Sc. 1974, George Washington University

H. Steven Kimmel, *Assistant Professorial Lecturer in Engineering*
B.S. 1968, University of Maryland; M.E.A. 1972, George Washington University

Ali Muhlis Kiper, *Professor of Engineering*
M.S. in M.E. 1950, Technical University of Istanbul; M.S. in M.E. 1954, Ph.D. 1956, Purdue University

Vladislav Klein, *Research Professor of Engineering*
M.E. 1954, Technical University, Czechoslovakia; Ph.D. 1974, Cranfield Institute of Technology, England

Joseph Alexander Knight, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1963, Virginia Polytechnic Institute and State University; M.S.(E.E.) 1965, Ph.D. 1968, Georgia Institute of Technology

Robert H. Korkegi, *Visiting Professor of Engineering and Applied Science*
B.S.(M.E.) 1949, Lehigh University; M.S. 1950, Ph.D. 1954, California Institute of Technology

Abdel Kader Kotb, *Professorial Lecturer in Engineering*
B.S. 1957, Cairo University; M.S. 1961, Ph.D. 1964, University of Oklahoma

Clifford Alfons Kottman, *Associate Professorial Lecturer in Engineering*
B.S. 1964, Loyola Marymount University; M.S. 1966, Ph.D. 1969, University of Iowa

Gerald Joseph Kowalski, *Assistant Professorial Lecturer in Engineering*
B.S. 1968, Marshall University; M.S. 1970, University of Arkansas

Robert J. Kurzega, *Assistant Research Professor of Applied Science*
B.A. 1967, University of Chicago; M.S. 1970, Ph.D. 1976, Florida State University

*Nicholas Kyriakopoulos, *Associate Professor of Engineering*
B.E.E. 1960, M.S. in Engr. 1963, D.Sc. 1968, George Washington University

Paul A. Lamb, *Assistant Professorial Lecturer in Engineering*
B.S. (E.E.) 1960, University of Arizona; M.B.A. 1973, University of California, Los Angeles

Harry Hill Landon, *Professorial Lecturer in Engineering*
B.S. 1944, M.S. 1948, Case Western Reserve University; Ph.D. 1951, Yale University

Roger Henry Lang, *Professor of Engineering and Applied Science*
B.S. in E.E. 1962, M.S. in E.E. 1964, Ph.D. 1968, Polytechnic Institute of New York

*On sabbatical leave 1981-82 academic year.

Robert Edward Lawrence, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1968, M.S. 1969, Ph.D. 1972, Rensselaer Polytechnic Institute

James Der-Yi Lee, *Associate Research Professor of Engineering*
B.S. 1964, Taiwan University; M.S. 1967, Rice University; Ph.D. 1971, Princeton University

Robert Lee, *Assistant Professorial Lecturer in Engineering*
B.S. 1972, George Washington University

Ting N. Lee, *Professor of Engineering and Applied Science*
B.S. in E.E. 1962, Cheng Kung University, Taiwan; M.S. in E.E. 1965, Illinois Institute of Technology; Ph.D. 1972, University of Wisconsin, Madison

Lawrence Martin Leibowitz, *Associate Professorial Lecturer in Engineering*
B.S. 1960, M.S. 1964, New York University; D.Sc. 1978, George Washington University

Stephen B. Leighton, *Associate Professorial Lecturer in Engineering*
B.S. 1968, Yale University; M.S. 1969, D.Sc. 1976, Massachusetts Institute of Technology

Guy William Leonard, *Professorial Lecturer in Engineering*
B.S. in Chem. 1945, M.A. in Chem. 1946, Indiana University; Ph.D. in Chem. 1949, Massachusetts Institute of Technology

David Richard Levin, *Professorial Lecturer in Engineering*
B.A. 1934, M.A. 1936, J.D. 1936, Ph.D. 1937, University of Wisconsin

David Michael LeVine, *Associate Professorial Lecturer in Engineering*
B.S.E. 1963, M.S.E. 1964, M.S. 1966, Ph.D. 1968, University of Michigan

Hai Sang Lew, *Associate Professorial Lecturer in Engineering*
B.S. 1960, Washington University; M.S. 1963, Lehigh University; Ph.D. 1968, University of Texas

Herbert Arthur Leybold, *Associate Professorial Lecturer in Engineering*
B.C.E. 1955, Polytechnic Institute of New York; M.S. in M.E. 1963, Virginia Polytechnic Institute and State University; Ph.D. 1969, North Carolina State University at Raleigh

Harold Liebowitz, *Professor of Engineering and Applied Science; Dean of the School of Engineering and Applied Science*
B.Ae.E. 1944, M.Ae.E. 1946, D.Ae.E. 1948, Polytechnic Institute of New York

Elmer M. Lipsey, *Professorial Lecturer in Engineering*
B.S. 1944, U.S. Coast Guard Academy; M.S. in E.E. 1958, U.S. Air Force Institute of Technology; D.Sc. 1975, George Washington University

James Alan Lisnyk, *Associate Professorial Lecturer in Engineering*
B.S. 1963, Webb Institute of Naval Architecture; M.S. 1964, Massachusetts Institute of Technology; D.Sc. 1977, George Washington University

Shih-Chi Liu, *Professorial Lecturer in Engineering*
B.S. 1960, National Taiwan University; M.S. 1964, Ph.D. 1967, University of California, Berkeley

John D. Liveris, *Assistant Professorial Lecturer in Engineering*
B.S.M.E. 1974, Tufts University; M.E.A. 1976, George Washington University

Thomas Phillip George Liverman, *Professor of Mathematics and Adjunct Professor of Engineering and Applied Science*
B.A. 1941, University of Montpellier, France; M.A. 1948, Ph.D. 1956, University of Pennsylvania

David D. Loendorf, *Assistant Professorial Lecturer in Engineering*
B.S. 1969, M.S. 1971, Old Dominion University; M.S. 1974, University of Michigan

Murray Howard Loew, *Associate Professor of Engineering*
B.S.E.E. 1965, Drexel University; M.S.E.E. 1967, Ph.D. 1972, Purdue University

Laurence Keith Loftin, Jr., *Professorial Lecturer in Engineering*
B.M.E. 1943, University of Virginia

Edward R. Long, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1967, College of William and Mary; Ph.D. 1974, North Carolina State University

Gerald Dean Love, *Professorial Lecturer in Engineering*
B.S. in C.E. 1949, M.S. in C.E. 1956, Iowa State University; D.Eng. 1975, Rensselaer Polytechnic Institute

Robert John Lynch, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1963, Naval Postgraduate School; M.E.A. 1975, George Washington University

Gordon Edward Lyon, *Associate Professorial Lecturer in Engineering*
B.S. 1964, Michigan Technological University; M.S. 1966, M.S. 1967, Ph.D. 1972, University of Michigan

Khalid Mahmood, *Professor of Engineering*
B.A. 1950, B.S. 1953, Panjab University, Pakistan; M.S. 1964, University of Washington; Ph.D. 1971, Colorado State University

George T. Malley, *Professorial Lecturer in Engineering*
B.A. 1936, University of Rochester; J.D. 1948, Cornell University

Clara F.M. Hong Manders, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Polytechnic Institute of New York; M.S. 1965, Northeastern University; M.S. in Engr. 1968, University of Florida

Arthur Frank Manfredi, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1965, The Cooper Union; M.S. 1968, Polytechnic Institute of New York; D.Sc. 1975, George Washington University

Michael J. Marcus, *Professorial Lecturer in Engineering*
B.S. 1968, D.Sc. 1972, Massachusetts Institute of Technology

J. Richard Margulies, *Associate Professorial Lecturer in Engineering*
B.S. 1967, Cornell University; M.E.A. 1971, George Washington University; J.D. 1974, Georgetown University

William Henry Marlow, *Professor of Operations Research*
B.S. 1947, St. Ambrose College; M.S. 1948, Ph.D. 1951, University of Iowa

Ward Douglas Maurer, *Professor of Engineering and Applied Science*
B.S. 1958, University of Chicago; M.A. 1962, Ph.D. 1965, University of California, Berkeley

Charles W. Maus III, *Assistant Professorial Lecturer in Engineering*
B.S. 1962, West Virginia Institute of Technology; M.B.A. 1972, Virginia Polytechnic Institute and State University

Paul D. Maycock, *Professorial Lecturer in Engineering*
B.S. 1957, M.S. 1962, Iowa State University

Richard McConnell, *Associate Professorial Lecturer in Engineering*
B.C.E. 1950, George Washington University; M.S. 1960, University of Illinois; Ph.D. 1974, Catholic University of America

Garth Philip McCormick, *Professor of Applied Science*
B.A. 1956, Oberlin College; M.A. 1959, University of Michigan

Paul Franklin McCoy, *Associate Professorial Lecturer in Engineering*
B.A. 1967, Harvard University; M.S. 1969, Ph.D. 1976, Stanford University

Terrence Patrick McGarty, *Professorial Lecturer in Engineering*
B.E. 1965, Manhattan College; M.S. 1966, E.E. 1969, Ph.D. 1971, Massachusetts Institute of Technology

Gerald Robert McNichols, *Professorial Lecturer in Engineering*
B.S. 1965, Case Western Reserve University; M.S. 1966, University of Pennsylvania; D.Sc. 1976, George Washington University

Subhash C. Mehrotra, *Associate Professorial Lecturer in Engineering*
B.Tech. 1959, I.I.T. Kharagpur, India; M.S. 1967, University of Iowa; Ph.D. 1973, University of California

Arnold Charles Meltzer, *Professor of Engineering and Applied Science*
B.S. in Engr. 1958, M.S. in Engr. 1961, D.Sc. 1967, George Washington University

Richard Eugene Merwin, *Research Professor of Engineering*
B.S. in E.E. 1943, Ph.D. 1965, University of Pennsylvania; M.S. in E.E. 1960, Syracuse University

David John Michel, *Professorial Lecturer in Engineering*
B.S. 1964, University of Missouri, Rolla; M.S. 1966, Ph.D. 1968, Pennsylvania State University

Martin Milton Mikulas, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1964, Ph.D. 1970, Virginia Polytechnic Institute and State University

Bennett Miller, *Professorial Lecturer in Engineering*
B.A. 1959, M.A. 1961, Ph.D. 1965, Columbia University

Douglas Rathke Miller, *Associate Professor of Operations Research*
B.S. 1966, Carnegie-Mellon University; M.A. 1969, Ph.D. 1971, Cornell University

Joseph David Morgan, Jr., *Professorial Lecturer in Engineering*
B.S. 1959, U.S. Air Force Academy; M.S. 1968, Ph.D. 1974, George Institute of Technology

Daniel R. Mulville, *Assistant Professorial Lecturer in Engineering*
B.S. in M.E. 1962, M.S. 1966, George Washington University; Ph.D. 1974, Catholic University of America

Samuel A. Musa, *Professorial Lecturer in Engineering*
B.S. 1961, Rutgers—The State University; M.S. 1962, Ph.D. 1965, Harvard University

Michael Kenneth Myers, *Professor of Engineering and Applied Science*
B.A. 1962, Willamette University; B.S. 1962, M.S. 1963, Ph.D. 1966, Columbia University

Mysore S. Nataraja, *Associate Professorial Lecturer in Engineering*
B.S.(C.E.) 1965, Bangalore University, India; M.S. 1967, Indian Institute of Technology; Ph.D. 1973, University of Pittsburgh

Edgar Henry Neal, *Assistant Professorial Lecturer in Engineering*
B.S.(E.E.) 1958, Pennsylvania State University; M.S.(E.E.) 1976, George Washington University

Christopher Ng, *Associate Professorial Lecturer in Engineering*
B.S. 1944, Chiao-Tung University, China; M.S. 1959, University of Connecticut; Ph.D. 1973, University of Maryland

Ahmed Khairy Noor, *Professor of Engineering and Applied Science*
B.S. 1958, Cairo University, Egypt; M.S. 1961, PhD. 1963, University of Illinois

Walter Robert Nunn, *Professorial Lecturer in Engineering*
B.A. 1957, M.A. 1961, University of California; Ph.D. 1972, George Washington University

Barry David Nussbaum, *Associate Professorial Lecturer in Engineering*
B.S. 1968, Rensselaer Polytechnic Institute; M.S. 1971, D.Sc. 1978, George Washington University

Morris Solomon Ojalvo, *Professorial Lecturer in Engineering*
B.M.E. 1944, The Cooper Union; M.M.E. 1949, University of Delaware; Ph.D. 1962, Purdue University

Lin-Sen Pan, *Associate Professorial Lecturer in Engineering*
B.S.(Ch.E.) 1960, Taiwan Cheng-Kung University; M.S. 1964, Ph.D. 1967, University of Utah

Francis P. Pantuso, *Associate Professorial Lecturer in Engineering*
B.E.E. 1963, Manhattan College; M.S. in E.E. 1965, Newark College of Engineering; Ph.D. 1973, Polytechnic Institute of New York

Stephen Kent Park, *Assistant Professorial Lecturer in Engineering*
B.S. 1964, Shippensburg State College; M.S. in Applied Math. 1967, Ph.D. 1970, North Carolina State University at Raleigh

Louis F. Pau, *Professorial Lecturer in Engineering*
M.S. 1969, Ph.D. 1972, D.Sc. 1975, University of Paris

S. F. Pauls, *Assistant Professorial Lecturer in Engineering*
B.A. 1958, College of William and Mary; M.S.A. 1970, George Washington University

Raymond L. Pickholtz, *Professor of Engineering and Applied Science*
B.E.E. 1954, M.E.E. 1958, City University of New York, City College; Ph.D. 1966, Polytechnic Institute of New York

Joseph L. Pokorney, *Assistant Professorial Lecturer in Engineering*
B.S. 1962, University of Wisconsin; M.S. 1967, Northeastern University

Pathickal K. Poulose, *Assistant Research Professor of Engineering*
B.S. 1959, University of Kerala, India; B.E. 1965, M.E. 1967, Indian Institute of Science; Ph.D. 1973, University of Connecticut

Manuel Jack Queijo, *Professorial Lecturer in Engineering*
B.S. 1944, Worcester Polytechnic Institute; M.S. 1954, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Alvin Radkowsky, *Research Professor of Applied Science*
B.S.E., City University of New York, City College; A.M. 1942, George Washington University; Ph.D. 1947, Catholic University of America

Ivatury Sanyasi Raju, *Assistant Research Professor of Engineering and Applied Science*
B.S.(M.E.) 1965, Andhra University, India; M.E. 1967, Ph.D. 1973, Indian Institute of Science

Walter Phillip Reid, *Adjunct Professor of Engineering*
B.S. 1938, M.S. 1939, Carnegie-Mellon University; Ph.D. 1942, University of Pittsburgh

Robert Bruce Reynolds, *Assistant Professorial Lecturer in Engineering*
B.A. 1965, Emory and Henry College; M.C.S. 1970, University of Virginia; M.S. 1974, George Washington University

Ferdinand Joseph Ricci, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1962, Michigan State University; M.S. in E.E. 1966, Newark College of Engineering; Ph.D. 1973, Catholic University of America

David Caron Roberts, *Associate Professorial Lecturer in Engineering*
B.S. 1965, Johns Hopkins University; M.S.E. 1968, University of Pennsylvania; M.S. 1973, University of Maryland

Derrill Conway Rohlfs, *Associate Professor of Engineering and Applied Science*
B.E.E. 1955, M.S. in Engr. 1959, George Washington University

Peter David Rosenberg, *Associate Professorial Lecturer in Engineering*
B.A. 1962, B.Ch.E. 1963, New York University; J.D. 1968, New York Law School; LL.M. 1971, George Washington University

*Sam Rothman, *Professor of Engineering Administration*
B.S. 1943, Long Island University; M.A. 1954, Ph.D. 1959, American University

Meir Rozansky, *Associate Professorial Lecturer in Engineering*
B.S.(M.E.) 1973, M.E.A. 1974, George Washington University

Llewellyn Adam Rubin, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1955, M.S.(E.E.) 1958, University of Pennsylvania

Harry L. Runyan, Jr., *Associate Research Professor of Engineering*
B.S.(M.E.) 1939, Rutgers—The State University; M.A.E. 1951, University of Virginia; Ph.D. 1974, Loughborough University of Technology, England

John Baptist Scalzi, *Professorial Lecturer in Engineering*
B.S. 1938, Worcester Polytechnic Institute; M.S. 1940, D.Sc. 1951, Massachusetts Institute of Technology

Leon Scharff, *Professorial Lecturer in Engineering*
B.S. 1942, City University of New York, City College; B.S.(E.E.) 1947, Massachusetts Institute of Technology; M.S.(E.E.) 1952, University of Maryland

Allan Schneider, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1959, B.S.E.P. 1960, Lehigh University; M.S. in E.E. 1962, Columbia University; Ph.D. 1974, University of Maryland

James H. Schulman, *Research Professor of Engineering*
B.S. 1939, Ph.D. 1942, Massachusetts Institute of Technology

Benjamin L. Schwartz, *Professorial Lecturer in Engineering*
B.S. 1945, M.S. 1946, Carnegie-Mellon University; Ph.D. 1965, Stanford University

Homer Belk Sewell, *Professor of Engineering Administration*
B.S. 1945, U.S. Naval Academy; M.E.A. 1958, George Washington University; M.A. 1975, Ph.D. 1978, University of Lancaster

Bhupendra P. Shah, *Associate Professorial Lecturer in Engineering*
B.E. 1956, Baroda University, India; M.E. 1958, Indian Institute of Science; M.E.E. 1961, Syracuse University

Kanaiyalal R. Shah, *Professorial Lecturer in Engineering*
B.E. 1961, University of Barada; M.E. 1963, Gujaret University; M.S. 1965, Ph.D. 1969, University of Missouri

Presson Scott Shane, *Professor of Engineering Administration*
B.S. in Ch.E. 1941, University of Kansas; M.S. in Ch.E. 1946, Massachusetts Institute of Technology

*On sabbatical leave 1982 spring semester.

Ramesh Shankar, *Assistant Professorial Lecturer in Engineering*
B.Tech. 1969, Indian Institute of Technology; M.E.E. 1972, Ph.D. 1978, University of Delaware

Francis William Shepherd, *Associate Professorial Lecturer in Engineering*
B.S. 1949, City University of New York, City College; M.S. 1950, University of Minnesota; M.E.A. 1960, D.Sc. 1977, George Washington University

John Edward Shore, *Professorial Lecturer in Engineering*
B.S. 1968, Yale University; Ph.D. 1974, University of Maryland

Barry Silverman, *Associate Professor of Engineering*
B.S. in E.E. 1975, M.S.E. 1977, Ph.D. 1977, University of Pennsylvania

Joseph Robert Silverman, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1959, Northeastern University; M.S. 1968, D.Sc. 1977, George Washington University

Harcharan Singh, *Associate Professorial Lecturer in Engineering*
B.Eng. 1964, University of Malaya; M.S. 1967, University of Hawaii; Ph.D. 1971, Cornell University

Nozer Darabsha Singpurwalla, *Professor of Operations Research and Research Professor of Statistics*
B.S. 1959, B.V. Bhoomraddi College of Engineering and Technology, India; M.S. in I.E. 1964, Rutgers—The State University; Ph.D. 1968, New York University

Earl Franklin Skelton, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Fairleigh Dickinson University; Ph.D. 1967, Rensselaer Polytechnic Institute

David Russell Smith, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, Randolph-Macon College; M.S. (E.E.) 1970, Georgia Institute of Technology; D.Sc. 1977, George Washington University

Jaroslaw Sobieski, *Associate Professorial Lecturer in Engineering*
B.S. 1955, M.S. 1957, D.Engr. 1964, Technical University of Warsaw

Richard M. Soland, *Professor of Operations Research*
B.E.E. 1961, Rensselaer Polytechnic Institute; Ph.D. 1964, Massachusetts Institute of Technology

John Paul Solomond, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1977, M.S. in E.E. 1972, Carnegie-Mellon University; Ph.D. 1976, Texas A&M University

Robert Martin Sorensen, *Adjunct Professor of Engineering*
B.S. in C.E. 1960, Newark College of Engineering; M.S. in C.E. 1962, Lehigh University; Ph.D. 1966, University of California, Berkeley

Bland A. Stein, *Assistant Professorial Lecturer in Engineering*
B.S. 1956, City College of New York; M.S. 1964, Virginia Polytechnic Institute and State University

Manuel Stein, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1943, University of Pittsburgh; M.Ae.E. 1951, University of Virginia; Ph.D. 1958, Virginia Polytechnic Institute and State University

Henry Malcolm Steiner, *Professor of Engineering Administration*
B.A. in M.E. 1944, M.S. in C.E. 1950, Ph.D. 1965, Stanford University

Karin Steinhaus, *Lecturer in English*
B.A. 1969, Oglethorpe University; M.A.T. 1970, School for International Training; M.S. 1978, Georgetown University

Kenneth Sutton, *Assistant Professorial Lecturer in Engineering*
B.S. 1962, M.S. 1964, University of Florida; M.S. 1967, George Washington University; Ph.D. 1973, North Carolina State University

Roy C. Swanson, Jr., *Assistant Professorial Lecturer in Engineering*

Willard Lucian Taylor III, *Assistant Professorial Lecturer in Engineering*
B.S.M.E. 1967, M.S.I.E. 1975, University of Rhode Island; M.E.(Mgt.) 1976, Boston University

Darrell Ray Tenney, *Associate Professorial Lecturer in Engineering*
B.S. 1964, West Virginia Wesleyan; Ph.D. 1969, Virginia Polytechnic Institute and State University

Harry Marshall Thron, Jr., *Assistant Professorial Lecturer in Engineering*
B.Ch.E., 1967, M.S. 1969, Georgia Institute of Technology; M.S. 1975, George Washington University

Samuel Coakley Tignor, *Professorial Lecturer in Engineering*
B.S. 1958, Virginia Polytechnic Institute and State University; M.S. (C.E.) 1966, Catholic University of America; M.S. (S.E.) 1970, Ph.D. 1974, University of Michigan

Robert Yen-ying Ting, *Associate Professorial Lecturer in Engineering*
B.S. 1964, National Taiwan University; M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1971, University of California, San Diego

Theodore George Toridis, *Professor of Engineering and Applied Science*
B.S. 1954, Robert College, Turkey; M.S. 1961, Ph.D. 1964, Michigan State University

James Victor Tracy, *Assistant Professorial Lecturer in Engineering*
B.A.E. 1968, University of Virginia; M.A. 1971, M.S. 1971, Ph.D. 1973, Princeton University

Avtar Krishan Trehan, *Adjunct Associate Professor of Engineering*
B.S. 1962, University of Allahabad, India; M.S. 1967, Brown University; Ph.D. 1971, University of Maryland

Robert S. Triplett, *Professorial Lecturer in Engineering*
B.S. 1940, University of Kentucky; M.A. 1943, University of Chicago; Ph.D. 1976, Laurence University

Warren Viessman, Jr., *Professorial Lecturer in Engineering*
B.E. 1952, M.S.E. 1958, D.Engr. 1961, Johns Hopkins University

Gerald David Walberg, *Assistant Professorial Lecturer in Engineering*
B.S. 1956, M.S. 1963, Virginia Polytechnic Institute and State University; Ph.D. 1974, North Carolina State University

Thomas Michael Walsh, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1953, Ohio University; M.S.E. 1962, University of Akron

Todd Leon Walton, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1970, University of Cincinnati; M.S. 1972, Ph.D. 1979, University of Florida

Chai-Ho Charles Wang, *Associate Professorial Lecturer in Engineering*
B.A. 1964, Fort Lewis College; M.A. 1968, University of Washington; Ph.D. 1974, University of Denver

Andrew B. Wardlaw, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1967, Bucknell University; M.S. 1968, Ph.D. 1971, University of Pennsylvania

Wasyl Wasylkiwskyj, *Professorial Lecturer in Engineering*
B.E.E. 1957, City University of New York, City College; M.S. in E.E. 1965, Ph.D. 1968, Polytechnic Institute of New York

Robert C. Waters, *Professor of Engineering Administration*
B.S. 1956, M.B.A. 1963, University of California, Los Angeles; D.B.A. 1968, University of Southern California

John Richard Weggel, *Professorial Lecturer in Engineering*
B.S. 1964, Drexel University; M.S. 1966, Ph.D. 1968, University of Illinois

Benjamin Whang, *Professorial Lecturer in Engineering*
B.C.E. 1959, M.C.E. 1961, Polytechnic Institute of New York; Ph.D. 1968, Massachusetts Institute of Technology

John Lindsey Whitesides, Jr., *Professor of Engineering and Applied Science*
B.S. 1965, Ph.D. 1968, University of Texas

Frank Leroy Willingham, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1961, University of Florida; M.S. 1976, University of Maryland

Alfred Abraham Wolf, *Professorial Lecturer in Engineering*
B.S. (E.E.) 1948, Drexel University; M.S. (E.E.) 1954, Ph.D. 1958, University of Pennsylvania; Sc.D. 1977, M.D. 1978, University of Juarez

Chieh Wu, *Associate Professorial Lecturer in Engineering*
B.S.(Ch.E.) 1960, Chung-Yang College of Science & Technology, China; M.S.(Ch.E.) 1968, Villanova University; M.S. 1972, Ph.D. 1975, Drexel University

William W. Wu, *Associate Professorial Lecturer in Engineering*
B.S.E.E. 1961, Purdue University; M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1976, Johns Hopkins University

Michael Yachnis, *Professorial Lecturer in Engineering*
B.S. 1943, Military Academy, Greece; M.S. 1956, M.E.A. 1962, D.Sc. 1968, George Washington University

*Jann-Nan Yang, *Professor of Engineering and Applied Science*
B.S. 1961, National Taiwan University; M.S. 1964, University of Hawaii; D.Sc. 1967, Columbia University

Edward Carson Yates, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1948, M.S. 1949, North Carolina State University at Raleigh; M.S. 1953, University of Virginia; Ph.D. 1959, Virginia Polytechnic Institute and State University

A.M. Yen, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1960, Taipei Institute of Technology; Ph.D. 1969, Johns Hopkins University

Vujica Yevjevich, *Research Professor of Engineering*
C.E. 1936, University of Belgrade, Yugoslavia; H.E. 1938, University of Grenoble, Switzerland; D.Eng. 1955, Serbian Academy of Sciences, Yugoslavia

James Chun-ying Yu, *Associate Professorial Lecturer in Engineering*
B.S. 1962, National Taiwan University; M.S. 1968, Ph.D. 1971, Syracuse University

*Shao Wen Yuan, *Professor of Engineering and Applied Science*
B.S. 1936, University of Michigan; M.S. 1937, Ph.D. 1941, California Institute of Technology; Ae.E. 1939, Stanford University

Arthur Zachai, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1965, Case Western Reserve University; M.S. 1971, George Washington University

Mona Elwakkad Zaghloul, *Assistant Professor of Engineering and Applied Science*
B.S.(E.E.) 1965, Cairo University; M.S.(E.E.) 1970, M.Math. 1971, Ph.D. 1975, University of Waterloo, Canada

Robert M. Zeskind, *Associate Professorial Lecturer in Engineering*
B.S.E.E. 1965, Case Institute of Technology; M.S. 1968, D.Sc. 1973, George Washington University

Tse-Fou Zien, *Professorial Lecturer in Engineering*
B.S. 1958, National Taiwan University; M.S. 1963, Brown University; Ph.D. 1967, California Institute of Technology

Arthur Jay Ziffer, *Associate Professorial Lecturer in Engineering*
B.S. 1952, City University of New York, Queens College; M.S. 1954, University of Chicago

*On sabbatical leave 1981-82 academic year.

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General Information	Private, nonsectarian, coeducational founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-Campus Students	8,886 full-time; 8,727 part-time (equivalent to 12,798 full-time students altogether)
Geographical Origin of Students	50 states, District of Columbia, 120 countries
Number of Full-time Faculty	1,087 (84% with doctoral degrees)
Number of Part-time Faculty	552 (includes some of the most distinguished men and women in Washington)
Room and Board	Cost varies from approximately $2,670 to $3,140 for the academic year (see pages 234–35)

Undergraduate majors: Accounting, American Civilization, American Literature, Anthropology, Applied Mathematics, Applied Statistics, Art History, Biology, Botany, Business Administration, Cartography, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archeology and Anthropology, Classical Archeology and Classics, Classical Humanities, Computer Science, Dramatic Art, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, English Literature, Environmental Studies, Fine Arts, French Language and Literature, Geodesy, Geography, Geology, Germanic Languages and Literatures, History, Human Kinetics and Leisure Studies, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Mathematical Statistics, Mathematics, Mechanical Engineering, Medical Technology, Middle Eastern Studies, Middle School Education, Music, Nursing Anesthesia, Nurse Practitioner Program, Oceanography, Operations Research and Computational Science, Philosophy, Physician's Assistant Program, Physics, Political Science, Premedicine, Psychology, Public Affairs, Radio-Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture —in Translation, Secondary Education, Sociology, Spanish American Literature, Spanish Language and Literature, Special Education, Speech Communication, Speech Pathology and Audiology, Urban Affairs, Zoology.

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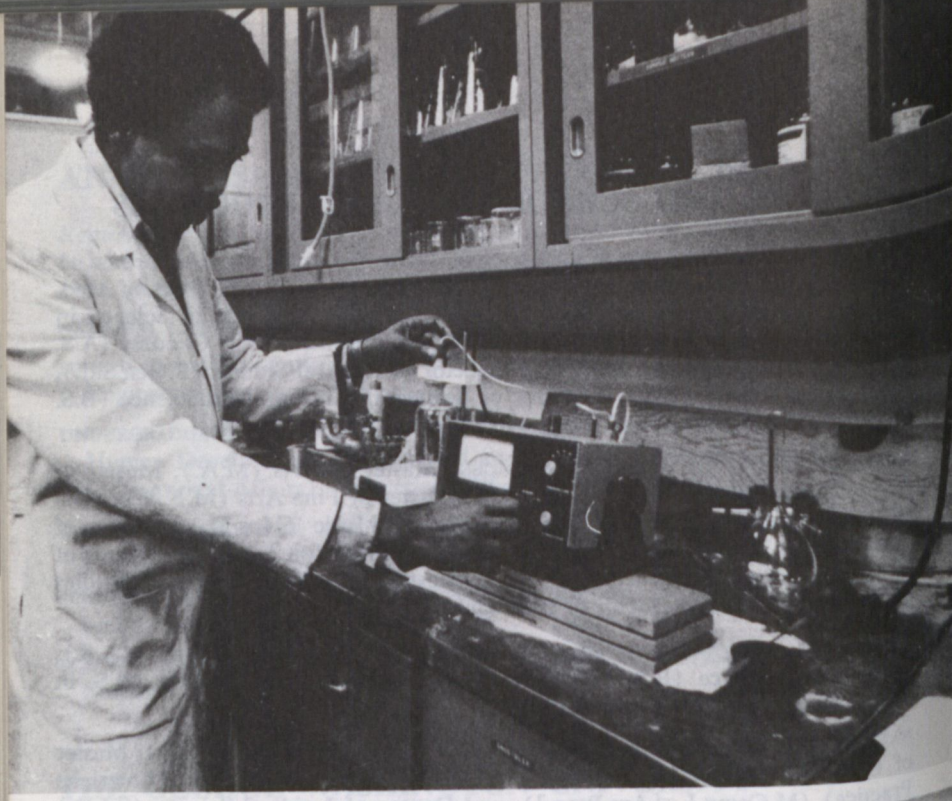

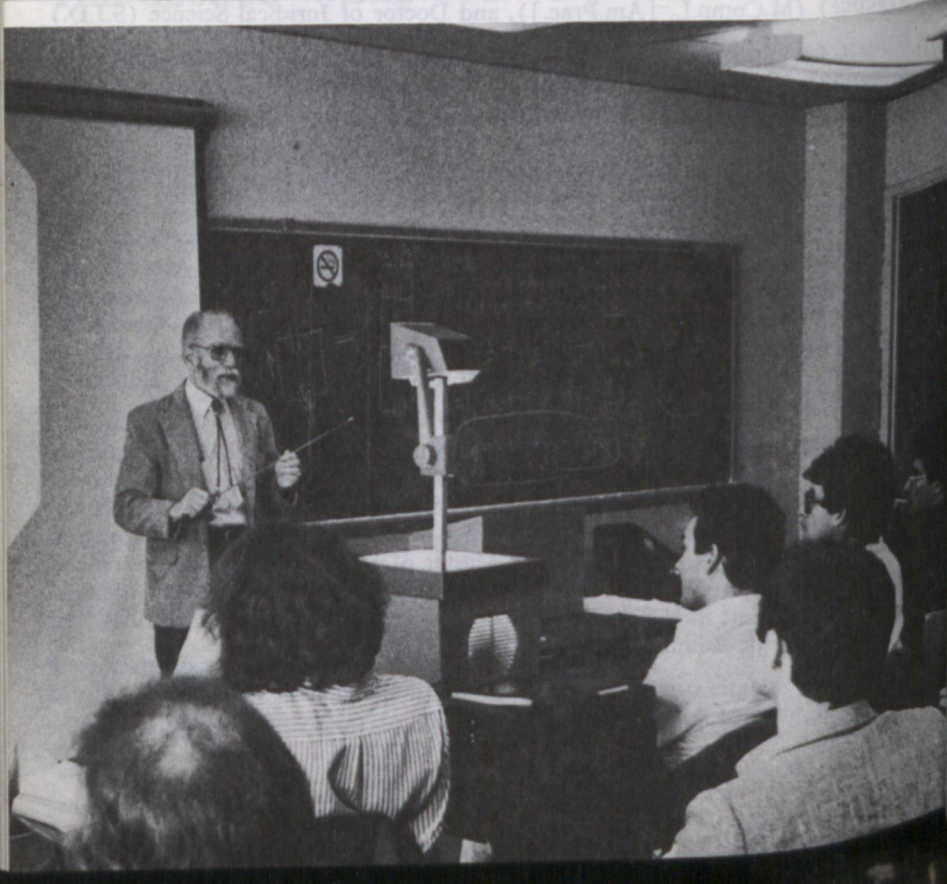

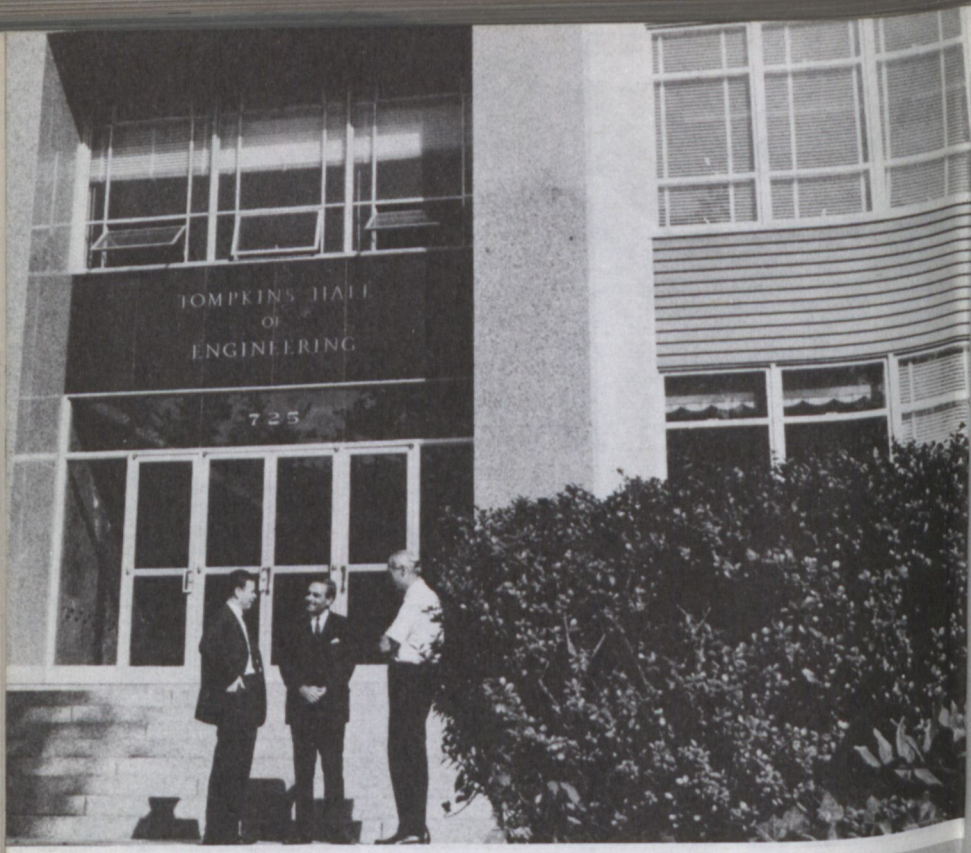
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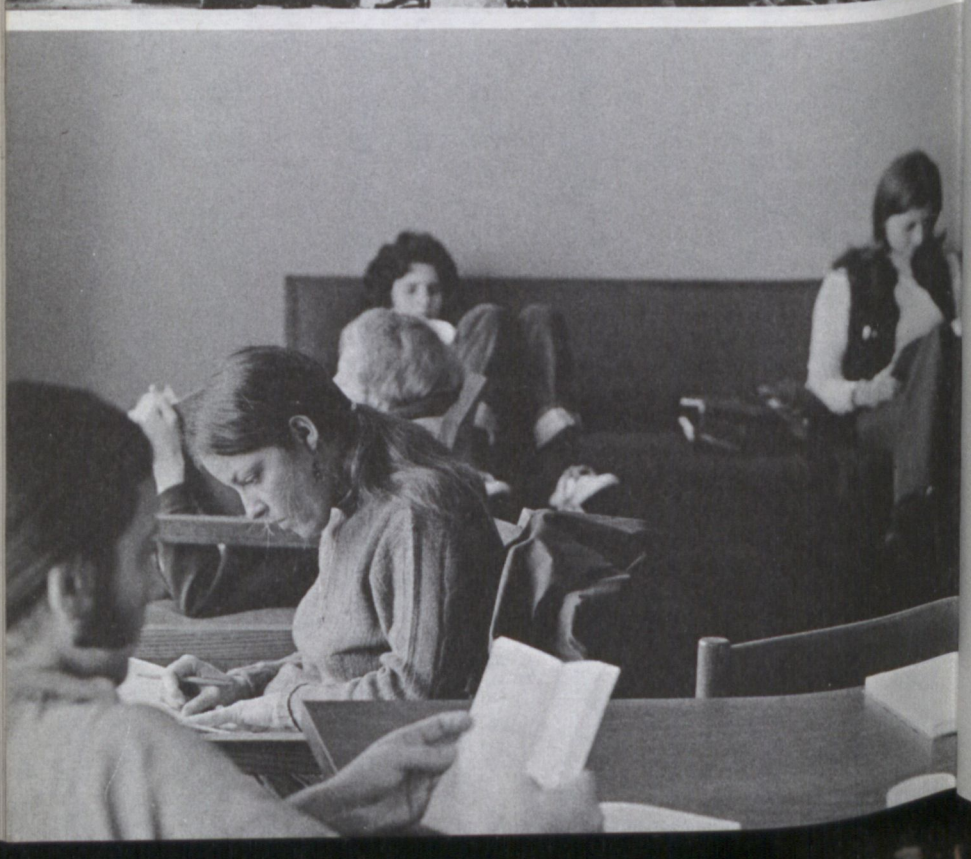

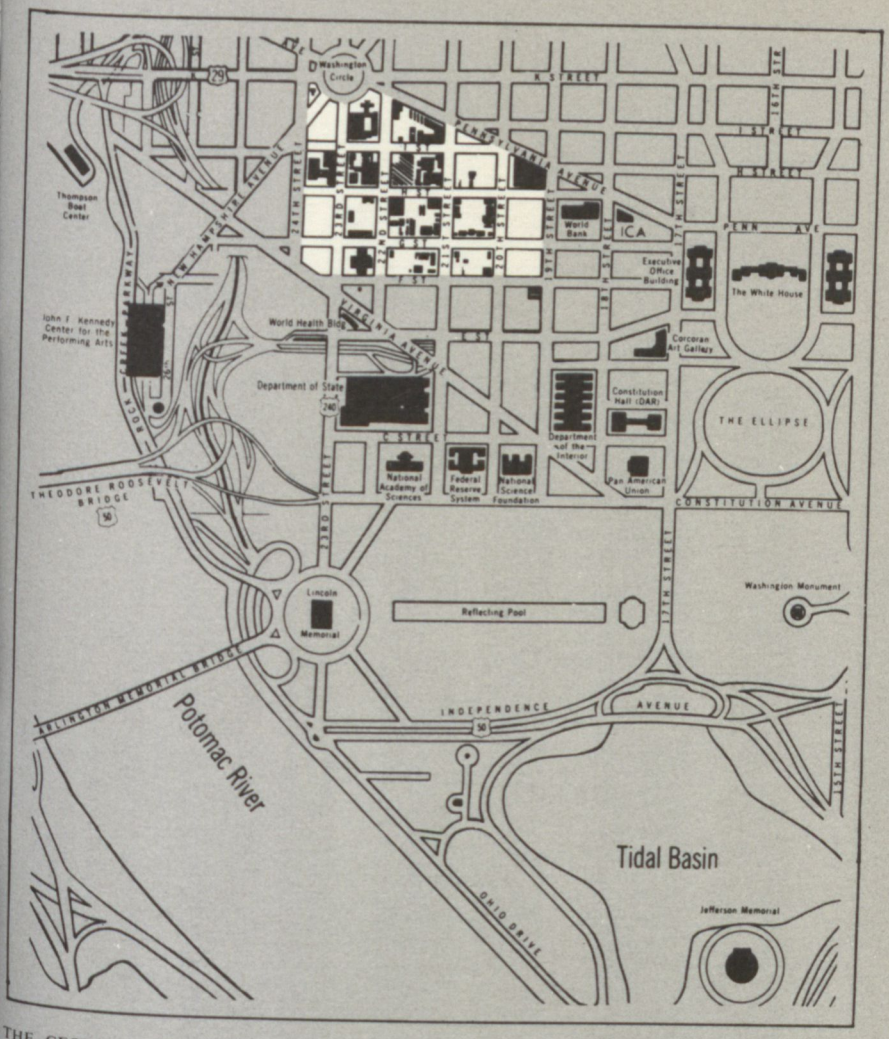

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